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AERONAUTICS DIVISION

MARCH 11th, 1948

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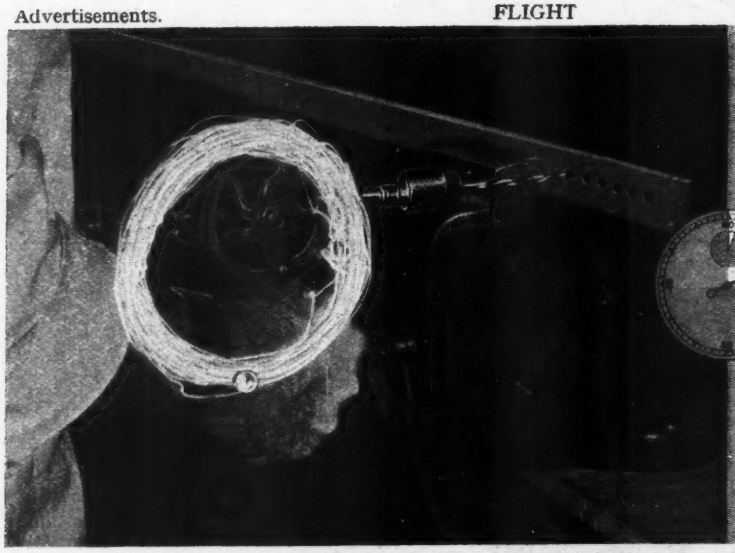

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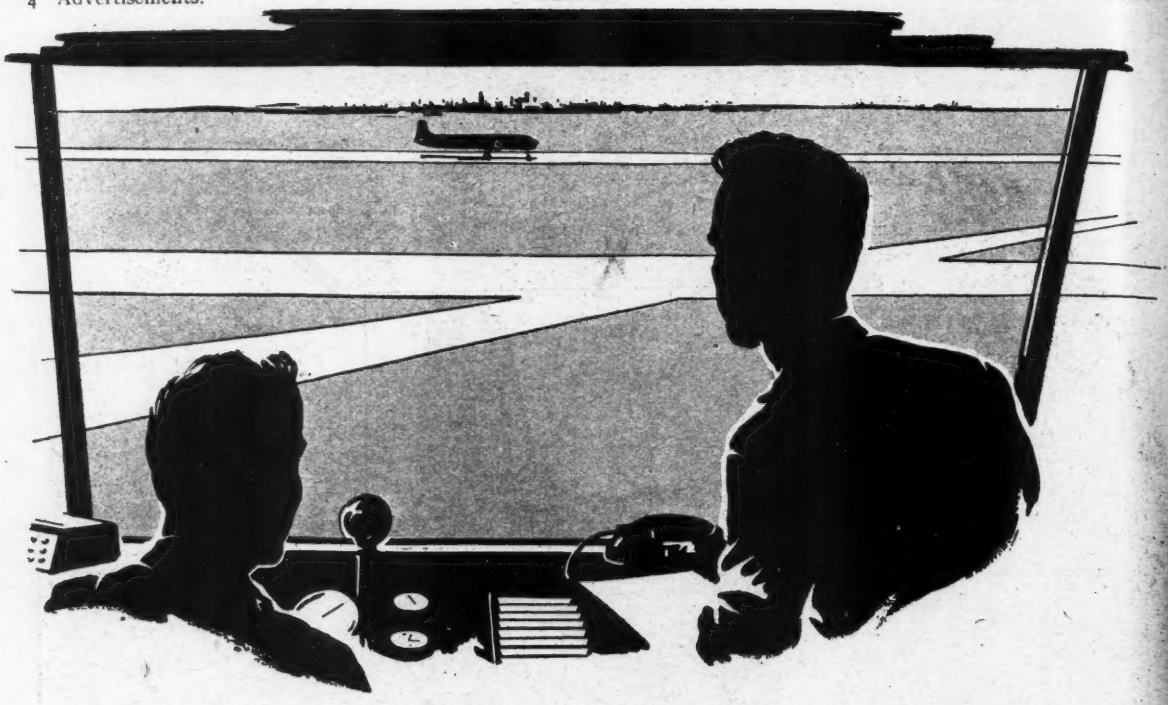

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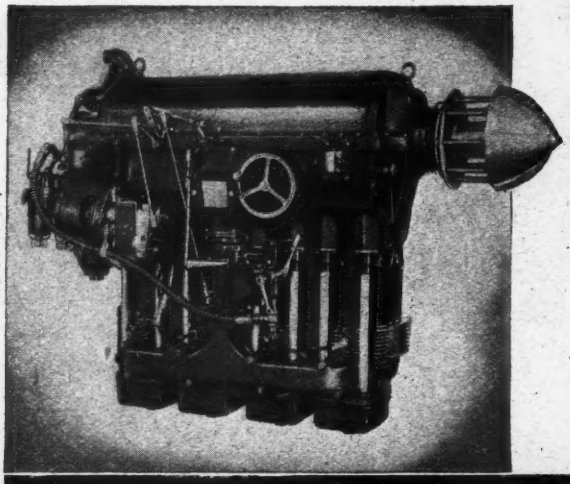

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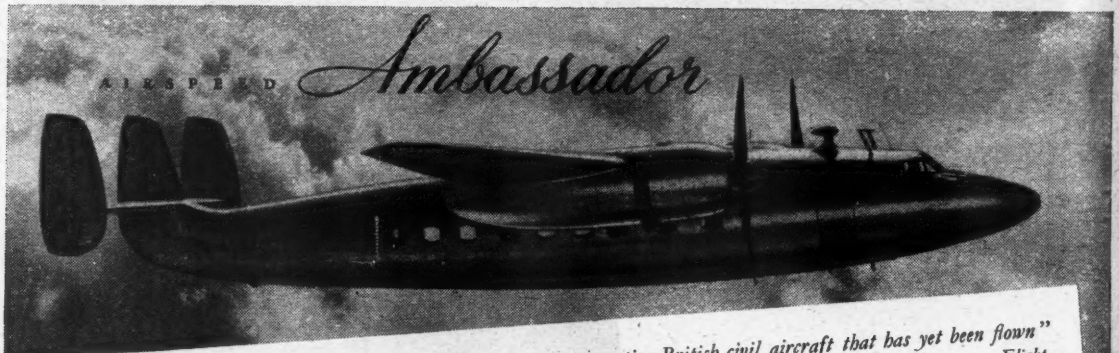

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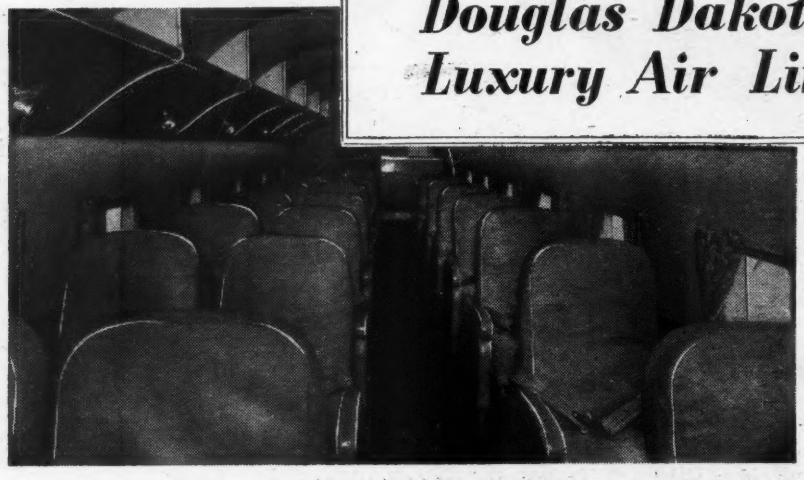

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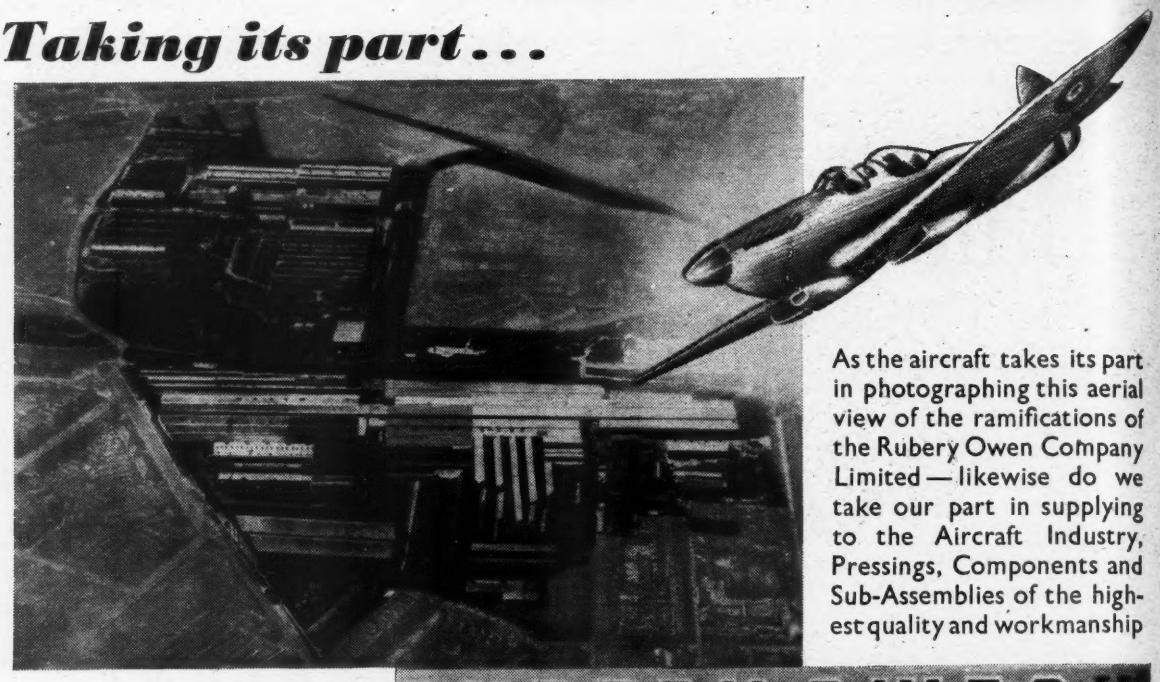

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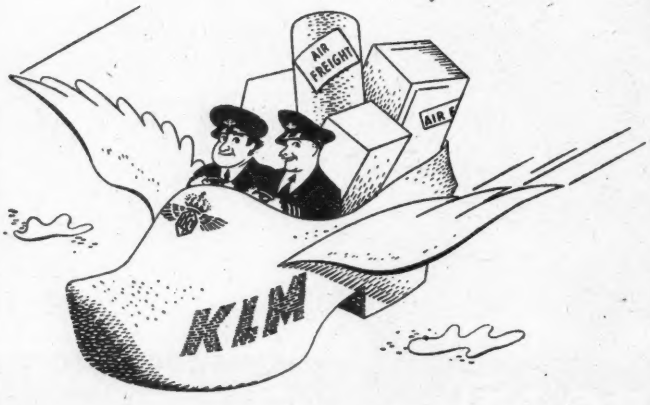

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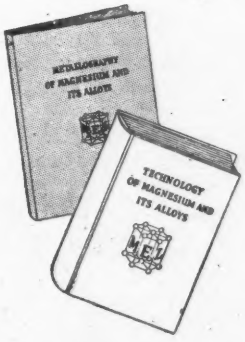

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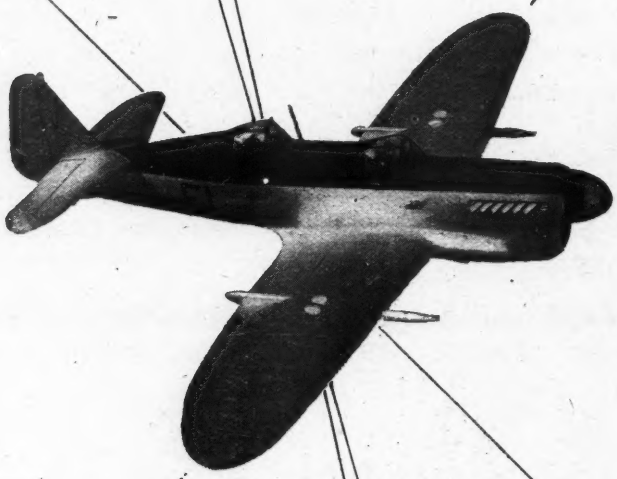

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The Outlook

The House on Bombers

COINCIDING with *Flight's* survey of British and foreign bombers, last Thursday's Commons Debate on the Air Estimates was another glaring symptom of national anxiety for our striking power. Having regard to Defence Regulations, we deliberately refrained in our own review from numerical assessment of Britain's bomber strength, but M.P.s—rugged non-conformists that they are—freely declared their estimates. G/C. Max Aitken doubted whether we could put many more than one hundred bombers into an operation, but even this meagre valuation seemed encouraging when set against the reckoning of "nearer twenty-five" by Mr. Quintin Hogg.

A point which we did feel constrained to make last week was that the Lincoln, fine machine as it is, is generally inferior in performance to America's wartime B-29, already being joined in service by the greatly superior B-50. Bearing this in mind, the Air Minister's "revelation" that the re-equipment of our bomber squadrons with Lincolns will be completed this year is hardly reassuring, nor does his doubly-hazy pronouncement that "the prospect of jet bombers is in sight," give hope that the quality of our striking force can be improved in under three years. Meanwhile, American squadrons will receive short-range jet bombers and ultra long-range piston-engined "heavies," one type, of Brabazon proportions, being capable of carrying 10,000 lb of bombs for 10,000 miles.

A. Cdre. Harvey, in his contribution to the Debate, referred to an "interim bomber" of which he had heard. Certainly a type vastly superior to the Lincoln, with a speed in excess of 450 m.p.h. and capable of penetrating, as Mr. Ward had the temerity to suggest, "beyond the iron curtain," could be built without recourse to unproven jets or even airscrew turbines, and it is earnestly to be hoped, having regard to the grave situation which now confronts us, that the possibilities of such a development will not be overlooked.

Foolish Virgins

ONE cannot help being most alarmed by the overall position of aviation in this country, and, in particular, by the irresponsible and complacent attitude of many of those whose task it is to maintain our strength and prestige. Whether the Government accept it or not, we have commenced an air age, and from now on air matters will continue more and more to influence the life of every individual.

The history of this country for centuries past has been vitally linked up with our Navy. Air is now taking over from the sea, and in a world made so much smaller by the speed and freedom of air travel we owe it not merely to ourselves alone to maintain our strength in the air. As a major power, we have a great responsibility to the British Empire, and to those free and friendly neighbours who depend upon a strong Britain for balance and stability. In the world to-day we must face the fact that strength is the only near-guarantee of security and the freedom to think and act in our own way. It is the weak who should fear attack.

There is neither the need, nor have we the ability at the present time, to launch a vast development scheme in the field of aviation, but it is vitally important that the present policy, which amounts almost to the suppression of the flying movement, be reversed at once. The United States, with its vast resources, has seen fit to institute a co-ordinated, nation-wide movement which will bring aviation into the daily lives of almost every American. Many of the European countries, according to their means, are giving aid and encouragement to everyone interested in flying, from the modellers and glider pilots to the captains of Service and commercial aircraft.

Aircraft and the men to fly them, no matter on what sort of duties, cannot be produced overnight. Moreover, no continuity of flow from year to year will be possible if the youth of the country, who will in a few years become the producers, operators and crews of the

MAR 15 1948

future aircraft, are handicapped by complete lack of facilities, aid or encouragement of any kind.

One would think that the establishment of air centres of the sort visualized in the Whitney Straight recommendations, would be welcomed almost as a Socialist ideal. Closely linked with the education of the air-minded youth of the country, whose enthusiasm and, perhaps to some extent, frustration, is demonstrated by the tremendous activity of two million modellers and spotters, such centres would benefit all levels of the community and assure results out of all proportion to the small national expense involved. It seems as if the Treasury has failed to appreciate how many and how much is involved.

Enforced neglect of civil aviation during the war years has led us to our present sorry position with regard to air lines and transport aircraft, and it is not necessary to look far, or to think very deeply, to appreciate the result of stop-gap measures and frantic last-minute plans which have been necessitated through lack of foresight and planning, and which seem lately to have characterized our national management. "Give us time" is often the cry, but the time it is taking to reorganize and re-equip the air lines is having a crippling effect, and it would be nothing short of madness to rely upon a "sitzkrieg" to give us time to prepare in the event of another war.

In spite of all this, complacent speeches are made about a highly trained, fully equipped air striking force, as if it was just around the corner, when, in fact, the bomber force, the R.A.F., and the industry which serves it have been, or rapidly are being, cut beyond the bone to the very marrow. Commercial aviation is stranded in an unhappy No-Man's-Land, with the antagonists, at present armed with nothing worse than mud, hurling their missiles over it. Other branches of civil aviation have been disowned and left to fend for themselves in a very hard world by parents who had previously promised much. What is put off to-day may not be possible to do to-morrow. Without planning and preparation the aviation allotment will bring forth little but a diet of mushrooms.

CONTENTS

Outlook	273
Tudor "In the Air"	275
Defence Debate	278
Civil Aviation News	279
Polar Lancasters	283
Army Crow's Nest	284
Royal Auxiliaries	a
More about Tudors	285
Aircraft Design Procedure	288
Aircraft Design Procedure Discussion	290
Air Estimates Debated	291
Here and There	292
Correspondence	294
Service Aviation	296

Forthcoming Events, page 295

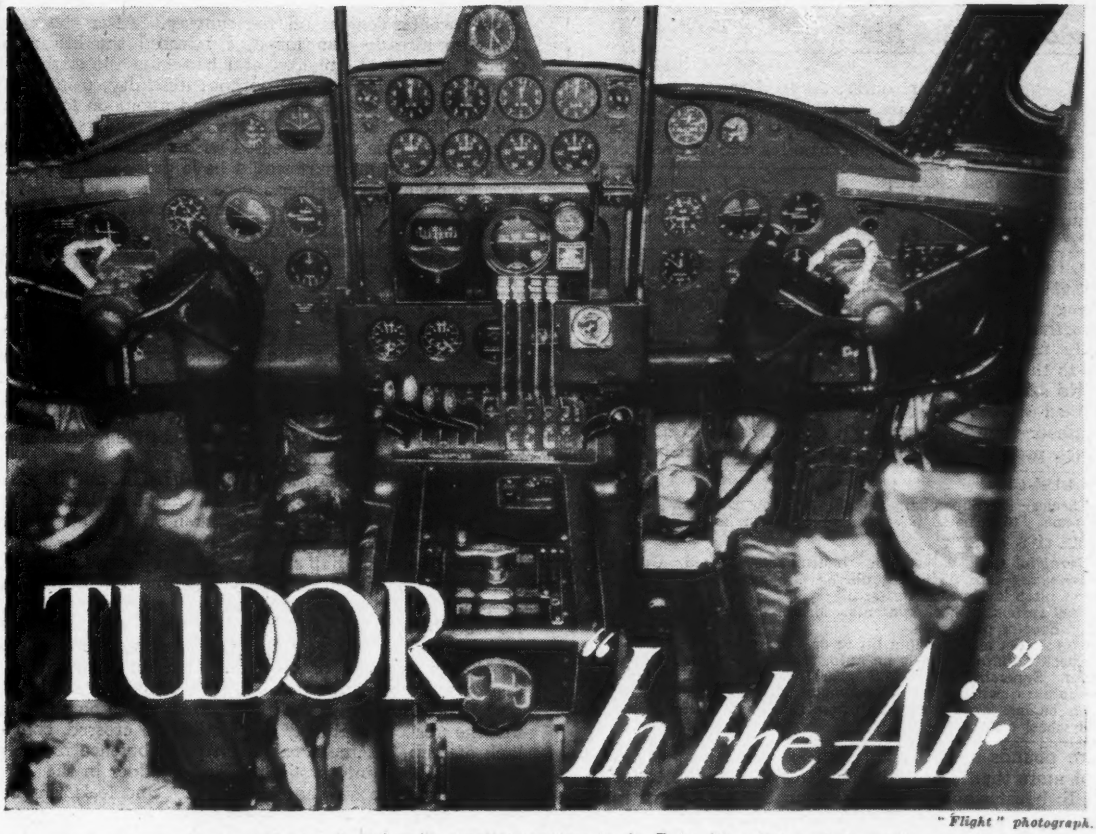
Helicopter Progress

DURING his recent talk to the Helicopter Association of Great Britain, Mr. Raoul Hafner gave a very informative "progress report" on the Bristol 171. The first prototype has by now done more than 40 hours of flying, has attained 120 m.p.h., has reached 6,000ft, and has been tried in autorotative flight. Mr. Hafner is confident that the Mark II, with Alvis engine, will reach a speed of 140 m.p.h.

That progress has been so rapid since the machine made its first free flight on July 24th is in a large measure due to the great trouble taken during the early stages of the design. Special test rigs, in addition to the rotor tower, were designed by Bristols, and every component subject to wear and stress was thoroughly tested under simulated working conditions. Long life and a high reliability factor were the aim throughout, and such things as bearings came in for very special attention, with the result that when the 171 goes into production, periods between overhauls should be much longer than those usually associated with helicopters.

We are sure that Bristols were wise in devoting so much time and money to the preliminary preparations.

FOR PROFIT OR PLEASURE; The first prototype of the Short Sealand I eight-passenger amphibian (two D.H. Gipsy Queen 70 engines), offered as a light transport or air yacht. With Alvis Leonides engines the type becomes the Sealand II. Both versions have already attracted numerous enquiries—especially from Scandinavia.



TUDOR "In the Air"

"Flight" photograph.

Instruments and controls are grouped in logical and convenient positions in the Tudor IV cockpit, and the windscreen panels are few and large for a pressurized hull. A plan of the engineer's panels in the roof is given overleaf.

An Hour at the Controls of "Star Leopard"

By Wing Cdr. MAURICE A. SMITH, D.F.C.

IN spite of the unkind things which have been said about the Tudors, I recently stepped into the first pilot's seat of *Star Leopard* with a feeling of pleasurable anticipation. However ill-qualified one may be as a judge, there is nothing like trying a machine for oneself. It was about two years since I had flown a four-engined aircraft, a Lancaster, although I had spent short periods at the controls of such aircraft as the Constellation, Hermes and Lancastrian during the intervening period. In the circumstances, my experience as pilot of a Tudor IV reflects favourably on its docility and straightforward handling characteristics.

Pre-flight briefing had been confined to half an hour's examination of the checks, operating data and handling notes, followed by a short conversation with Avro pilots on the merits and otherwise of wheel landings when carrying passengers. The chief outcome of this talk, however, was that it is better to fly a nosewheel aircraft!

It was necessary to take in details of cockpit layout in a very short time. This was not difficult as all essential flying controls and instruments are neatly and sensibly arranged. On B.S.A.A. aircraft, flight engineers' duties are handled by the second pilot, and his panel and controls are arranged mainly in the roof. In operation, this arrangement released an extra 150 cu ft for freight or baggage. On this particular flight Avro's chief test pilot, Mr. "Jimmy" Orrell, flew in the right-hand seat, and we carried a crew including a flight engineer, who stood between us to operate his controls. An external intercom plug is provided on most marks of Tudor, so that ground staff and crew may be in contact during starting and closing down. A summary of the preliminary checks and starting-up procedure follow, and other drills are given in their appropriate order.

PRELIMINARY CHECK ON ENTERING AIRCRAFT

Hydraulic accumulator not less than 220 lb/sq in. 1 and 2 fuel tank cocks on. Cross-feed cock off. Booster pumps off. Ground/flight switch to "flight." Starter isolating switch on. Circuit breaker "start" push-buttons in. Undercarriage indicator lights all on and green. Fuel contents gauge registering correctly. Gallons-gone meters set to zero. Flow meter by-pass set. Engine master cocks off. Pneumatic supply pressure over 160 lb/sq in. Undercarriage selector lever locked down.

ENGINE STARTING AND WARMING

Test fuel pumps by ammeter. Ground/flight switch to "ground" the plug-in starter battery. Engine master cocks off. Throttles half-inch open. Airscrew controls fully fine. Supercharger control M.S. Warning light not showing. Hot and cold intake "cold." Radiator shutters override switch on "auto." Booster coil isolating switch on. Then:—(1) Turn on first engine master cock. (2) Select port or starboard as appropriate on priming pump master switch. (3) Switch on appropriate side booster pump until pressure shows 10 lb/sq in. (4) Press priming pump button. (5) Switch-on ignition and press starter button; when engine is running, booster coil and priming pump switches to "off." (6) When all four engines are running, ground/flight switch back to "flight."

After being shown the starting-up procedure for the four Merlins, I sat back waiting to be taxied off the tarmac, but my composure was short lived. A characteristic brief and to-the-point instruction from my "second pilot," followed by the folding of his arms, told me that I was taking over from the start. The Tudor was facing the hangars on a sloping tarmac with just room to turn, so the first thing to do was to start rolling and then to turn to starboard as sharply as possible without risking damage to the starboard tyre. The engines, of which the first pilot

Tudor "In the Air" . . . . .

can see only the port outer, seem very remote. There is no vibration as they are opened-up for taxying, the sound is distant, and the slight springiness and delay in response to the throttle controls accentuates the impression. To

CHECK BEFORE TAXYING

Radiator shutter switches to "manually open." Pilot's instrument panel air pressure 450 lb/sq in. Navigator's panel vacuum gauge 5 inches minimum.

me, the Tudor appeared to swing round with almost alarming ease and rapidity, and we were soon bowling smoothly along the perimeter track. The smooth and extremely effective action of the brakes was reassuring, and I successfully passed a parked Lincoln without getting a wheel on to the grass.

No other aircraft were using the airfield at the time, so I lined-up *Star Leopard* on the runway with care, and the engineer then went through the running-up and take-off check procedures with me. We translated inches of boost

ON RUN-UP

Check:—(a) Superchargers (b) Airscrew controls. (c) Ignition systems. (d) Engine powers (e) Slow running.

TAKE-OFF CHECK

Gyropilot speed valve open. Instruments engaged. Oil pump on.
Trimming tabs. Rudder, aileron and elevator all neutral. Airscrew pitch levers fully forward.
Fuel system. Check contents. Master cocks on. Cross-feed cock off. Booster pumps on.
Flaps. Set at maximum lift at 62.5 per cent travel.
Check radiator shutters on auto. Oil temperature 25 deg C minimum. Superchargers in M.S. gear (red lights out). Hot and cold air intakes switches off. Flow-meter by-pass switch off. Finally, clear engines and make sure aircraft is lined up on runway with tail wheel central.

into pounds and decided that, as the all-up weight was not more than 70,000 lb, throttles at the gate to give plus 12 lb boost would be sufficient on the 1,600-yard runway. Full throttle through the gate gives +20 lb boost. Percentage flap and the equivalent degree figure were discussed, and about 25 degrees was lowered. Maximum travel is 40 degrees.

It should, perhaps, be mentioned here that I was purposely being left to apply what knowledge I had of Lancasters, Stirlings, etc., to the Tudor, and to get on with the flying in my own way unless I asked for advice or appeared to be about to make a goon move. This seemed a very fair way of proving the Tudor's qualities and of helping me to obtain an unbiased impression.

In view of past criticisms, the take-off was one of the particular points of interest of the flight. The runway was not very even, being gently stepped downhill, and a medium-strong wind was blowing from a little to port, about twenty degrees off the runway. After the careful lining-up already mentioned, I released the brakes and opened up rather gingerly, and corrected the slight early tendency to swing to port without difficulty, using rudder and throttles. As speed built up to about 60 knots, and the tail lifted, there was a further slight tendency to swing to port, and this was corrected with rudder alone. Better anticipation on my part would have prevented the second swing tendency altogether.

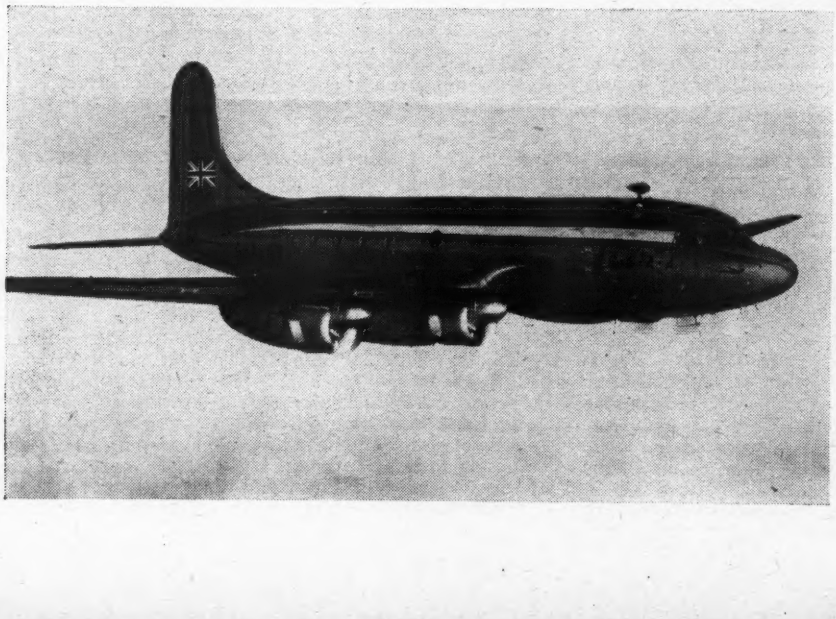
Finally, with a rather ham-handed movement (I hadn't realised that there was so much left) I pushed the throttles through the other half of their travel up to the gate, and the engineer took over. This last movement resulted in a roar from the Merlins and a healthy shove in the back, and we flew off almost at once with at least two hundred yards to spare and speed building up from 105 to 120 kt. It must be stressed that the swing tendency mentioned was very slight indeed, and that at first I had opened the throttles rather jerkily. It would also have been better to have opened all four throttles evenly to give, say, −2 lb boost against the brakes, instead of moving off from fast idling position as I had done.

Once wheels and flap were up, and r.p.m. and boost had been adjusted for climb, I turned about and made for a clear patch to the south. I had taken off with all trimmers neutral and had not noticed any appreciable change of trim as wheels and flap came up. A very small adjustment of the elevator wheel settled the machine in a steady climb at about 650 ft/min, with forward speed of around 140 kt. As we climbed, I tried a few turns and was surprised to find how light and effective the ailerons were. Except on the changeover, or rapid initiation of a turn with 30 deg or more of bank, there is no need to use rudder. At first I did too much with the rudder pedals on the climb, for the reason that any suggestion of crossed controls, lack of trim, or, more particularly, turbulence in the air, translates itself into a slight lateral shudder in the Tudors (and on some other large aircraft). One feels this occasional shimmy through the seat and instinctively tenses on the rudder pedals, anticipating the need to correct yaw. After levelling out in calmer air above cloud I did not feel this movement again. Flying as a passenger in the Tudor VII last year I had noticed a similar sensation in bumpy atmosphere.

It did not take long to settle down and feel comfortable and at home when cruising round with a low power setting at about 8,000ft and a speed of 160 kt I.A.S. The pilot can see just enough of the aircraft nose to give him a sight for level flight, and the field of view is better than on most pressurized aircraft of this size or larger.

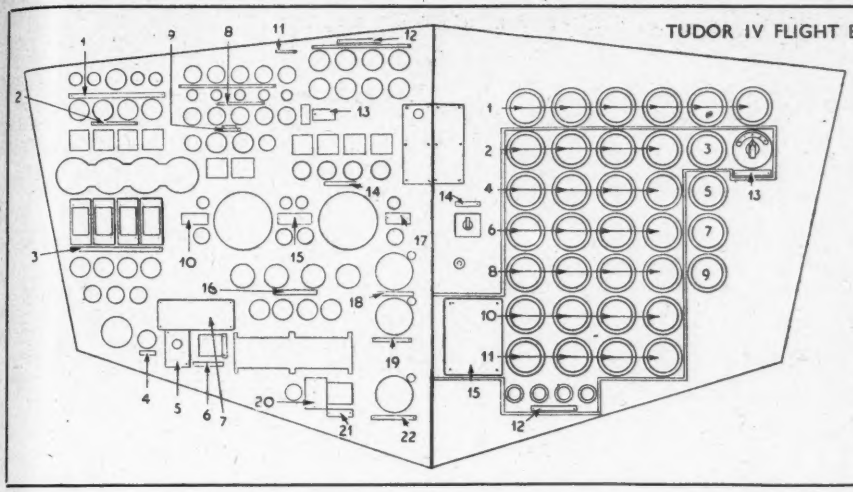
There was a job to be done on this flight, so I handed over for a short time to Mr. Orrell and then resumed control for return to Woodford and landing. The noise level in the cockpit is very low, and one can talk across to the co-pilot or engineer comfortably and without raising one's voice. The whole cockpit would, I think, be classed as comfortable by airline pilots.

On turns at various speeds I found that the ailerons remain light, but the elevators increase in weight and the nose needs to be held up. I tended to drop the nose on left-hand turns in particular. If there is anything to choose between them, I would say the rudder is the heaviest control under normal circum-



The Mk IV has the best proportions of any of the Tudor variants, and its attractive lines are well shown off in this photograph.
"Flight" photograph.

TUDOR IV FLIGHT ENGINEER'S ROOF PANELS



(Left panel): 1. Oil dilution selector switches; 2. Fuel pump switches; 3. Radiator flap inching control; 4. Current flow indicator; 5. Air intake; 6. Air cleaner; 7. Emergency instructions; 8. Fuel cock switches; 9. Pilot test buttons; 10. Port outer flow meter cut-out; 11. Cross feed cock; 12. Slow running cut-off; 13. Booster isolation switch; 14. Supercharger; 15. Port inner Starboard flow meter cut-out; 16. Feathering switches; 17. Starboard outer flow meter cut-out; 18. Roof panel lights; 19. Centre and second pilot's lights; 20. Off test release; 21. Dinghy release; 22. First pilot's panel lights. (Right panel): 1. Fuel contents; 2. Air intake temperature; 3. Engine charge temperature; 4. Fuel pressure; 5. Emergency air; 6. Oil contents; 7. Hydraulic pressure; 8. Oil pressure; 9. Auto pilot pressure; 10. Oil temperature; 11. Radiator temperature; 12. Coolant loss indicator; 13. Engine charge temp. (thermometer); 14. Label; 15. Engine data plate.

stances, but as speed increases (I took the Tudor up to about 200 kt indicated at 7,000ft) the elevator becomes noticeably and progressively heavier. The maximum diving speed is 280 kt (322 m.p.h.).

With permission, I next sampled the stall with flaps and wheels up, and sufficient power to silence the warning horn. I found that the first warning is given by very slight buffeting at speeds between 105 and 110 kt (weight approx. 65,000 lb). This buffeting increases and at 95 kt is severe and could not possibly be overlooked. A further backward movement on the wheel caused the nose and left wing to drop fairly abruptly. Recovery at all stages was immediate on easing the control wheel forward. Stalling speeds are quoted by the makers as follows:

Weight	u/c and flaps up	u/c and flaps down
80,000 lb ..	113 kt I.A.S. ..	99 kt I.A.S.
70,000 lb ..	106 kt I.A.S. ..	93 kt I.A.S.
60,000 lb ..	98 kt I.A.S. ..	86 kt I.A.S.

On the descent to the airfield the port outer engine was cut, and I tried holding course with rudder at about 170 kt. This presented no difficulty, and when the trimmer was used I found that a very small movement indeed enabled the machine to be flown straight with feet off. All the trimmers are very sensitive.

Back at the airfield, below cloud, the weather had deteriorated, and light and visibility were rather poor. I made two close and rather shapeless circuits, and with 25 degrees or more of bank had difficulty in seeing sufficient sideways to position the machine for the approach.

LANDING CHECK

Gyropilot oil pump switch off. Superchargers M.S. gear. Hot and cold air intakes off. Pneumatic supply pressure 450 lb/sq in.
U—Undercarriage down and checked.
P—Propeller 2,650 r.p.m. fully forward.
F—Flaps fully down.
F—Fuel booster pumps on.

I called for 2,650 r.p.m., Lancaster style, and wheels down at 140 kt, and again noticed little or no change of trim. I did not feel the wheels drop or lock down. Next I asked for 30 per cent flap but was told I might as well turn in and then put the lot down. We kept position with the help of a couple of landmarks pointed out to me on the approach. The initial approach and turn were made at 130 kt, and with flaps coming down the speed was reduced to 120 kt. As the flap angle increased, the nose came up, and some forward trim was required for comfort, and a little more engine to hold correct rate of descent. Having made a rather tight approach, the airfield boundary came up almost immediately, and we skimmed the hedge with a trickle of motor at about 115 kt.

Following earlier instructions I held off for a wheel landing after the engineer had cut the motors right back, and was surprised to feel the Tudor grease on without the slightest jolt. After a pause I lowered the tail but did not feel it touch, and then applied a squeeze of brake to help pull up and keep straight. The port outer Merlin was idling quite a lot too fast and produced some asymmetry as we slowed down, but this caused no trouble. I did not notice any directional instability during the landing, and decided that the smooth arrival must reflect considerable improvements in the design of large under-carriages during the last two or three years.

CHECK AFTER LANDING

Raise flaps. Radiator shutters at "manually open." Booster pumps off. Before stopping engines open-up to zero boost and exercise superchargers. Stop engines with slow-running cut-off solenoids. Switch off ignition. Turn off engine master cocks. Switch off electrical services. Set ground/flight switch to "ground."

Looking back on the flight I can honestly record that I enjoyed it very much and found nothing about the Tudor to offend me. It takes no more than an hour to get back the "big ship" complex, and to feel the thrill of responsibility, and the security and confidence of being one of a team, which distinguishes the enthusiasm of the "heavy" pilot from that of his lone-wolf fighter comrade.

NOTE

Pilot's notes and operating instructions for the Tudor IV give the following conditions for operation: Recommended climbing speed 135 kt I.A.S. sea level to 20,000ft, thereafter reducing speed by one knot per thousand feet. Supercharger gear change to F.S. 14,000 to 15,000ft with throttles at gate and 2,850 r.p m.

For maximum range M.S. gear 2,650 r.p.m. maintain 9 lb/sq in boost. When boost has fallen to 6 lb with throttle at gate engage F.S. gear and again maintain 9 lb. Cruise (a) at 140 kt (160 m.p.h.) or up to 10 per cent higher if speeds are obtainable at lowest possible r.p.m.; (b) in M.S. gear at maximum obtainable boost not exceeding 9 lb and holding recommended air speed with minimum r.p.m. down to 1,800.

LATEST TUDOR IV FIGURES

Four 1,740 b.h.p. Rolls-Royce Merlin 621 engines, with four-bladed de Havilland airscrews (13ft diam.)

Length	85ft 6in
Height	24ft
Span	120ft
Tailplane span	43ft
Cabin width	10ft
Gross wing area	1,421sq ft
Wheel track	23ft 9in
Gross weight	80,000 lb
Max. landing weight	74,000 lb
Equipped weight	45,176 lb
Fuel (3,300 gal.)	23,760 lb
Oil (150 gal.)	1,350 lb
Max. range with 9,720 lb payload	2,950 miles
" " " 3,450 lb "	4,030 miles
S.L. rate of climb (A.U.W. 80,000 lb)	790 ft/min
Distance to clear 50 ft	1,750yd
Service ceiling (4 engines)	26,000ft
" " (3 engines)	20,500ft
Recommended climbing speed	155 m.p.h.
Most economical cruising speed	160 m.p.h.
Max. cruising speed at 25,000ft	305 m.p.h.
Max. level speed	340 m.p.h.

Comment on the present position of the Tudors appears on pages 285-287

DEFENCE DEBATE

Manpower, Research, Secrecy : Our Jets Win Praise

MOVING that the House approve the Defence White Paper, extracts from which were given in *Flight* of February 26th, the Minister of Defence, MR. A. V. ALEXANDER, said that there was an inevitable temptation to trench upon the general foreign situation, which formed the necessary background against which our defence policy must be shaped. We had to relate the claims of the armed Forces in the matter of men and materials to the overall position as regards national income and expenditure.

The numbers in the Forces at March 31st would not be 1,087,000 as originally proposed, but 940,000. Of the 700,000 men who would be in the Forces in March, 1949, only some 400,000 would be trained Regulars. Nobody knew, particularly in the technical arms of the R.A.F. and the Royal Navy, exactly what technical developments would emerge. In the present position we had to have minimum Forces to meet emergencies, and these, for the time being, must be more or less of the conventional type.

Discussing the performance of aircraft, Mr. Alexander said that we were sparing no effort to maintain the lead which was of such vital importance during the war. The House knew that British jet propulsion engines were admitted to be the best in the world. We owed this to the professional zeal and ability of A. Cdre. Whittle and his collaborators, to the high skill of British manufacturing firms, and to the Government policy of providing the money for research and development. Mr. Alexander referred to the recent performance of the Vickers-Supermarine Attacker with which Mr. Lithgow averaged 565 m.p.h. round the 100-km. closed circuit, and pointed out that much of the cost of development work for defence yielded results of immense value to industry and therefore to the peacetime economy of the country.

The Minister went on to point out that there were nearly two civilians engaged on work directly for the Forces for every three who were in uniform. This, he said, had always been so.

The amount which could be done in the way of re-equipment and modernization in the Services must, unfortunately, be extremely modest. Our principal anxiety must be to maintain a healthy war potential. The existence of the National Service scheme was evidence to the world that Great Britain was alive to her responsibilities. Moreover, in the present circumstances, it would be foolish to think that we could meet our needs by relying on men on long-service engagements.

During the coming year, the R.A.F. would continue the process of reorganization. The Minister paid tribute to the standards of efficiency which the R.A.F. had contrived to maintain in spite of difficulties. For example, in December, 1947, scheduled services of Transport Command covered no less than 11,000,000 passenger miles with only one serious accident.

Loss of Technicians

The suspension of Regular enlistment during the war had resulted in the Royal Air Force losing since the end of the war a large majority of its trained technicians. As a result, it had had to devote a great part of its efforts to training in highly technical trades men who were able to give only short periods of productive service. The Regular content of the Royal Air Force was under 40 per cent. of the whole, and a great many of these Regular personnel had only recently been enlisted. He hoped for improvements in the Regular recruitment for the R.A.F. and the proportion of National Service men would, he expected, be reduced as this took place.

Overseas, the principal task of the Royal Air Force was to complete the re-deployment resulting from the withdrawal of our Forces from India, Pakistan and Palestine and, in particular, to provide and maintain the minimum base organization at key points in the Middle East and Far East, without which we should be unable to operate Air Forces in vital areas overseas in time of emergency.

The ultimate unification of the Services was not deemed inherently unsound or impossible of adjustment. To introduce a major development in the difficult and delicate post-war years would not, however, in the Government's view, have aided the task of providing economically efficient, balanced and contented Forces.

MR. EDEN said the House had not the slightest conception of how many bomber and fighter squadrons constituted our first-line strength. Between the wars we had that information at all times. He asked the Government for a little more examination of the secrecy aspect. He was not at all opposed to reliance to a large extent on the efficient Auxiliary Air Force, but the recruiting situation was far from satisfactory. There was no difficulty about aircrew, but ground crew were difficult to get. He was told that when young men did their temporary service for an hour or two on the airfields they did not get the rate of pay of the regular Air Force. They could not get their meals at the Service messes and had to buy them at the N.A.A.F.I.

BRIGADIER MEDLICOTT remarked that the White Paper pointed out that at the moment we did not possess a single Fleet aircraft-carrier. There were just two light Fleet carriers and no escort carriers. He wondered what the Russian High Command must think about this kind of disclosure.

MR. BELLENGER said that progress made in the methods of attack, particularly from the air, was not equalled by progress in methods of defence. The high-speed bomber, which could drop its bombs from a high elevation, was a very formidable weapon, and although radar and other equipment could give notice of its coming, the weapons with which to bring the bomber down before it reached this country were not so adequate as he had hoped.

SIR R. GLYN begged consideration for some form of "technical militia." He did not mind about uniform but was convinced there were men of high technical ability who served in the Army, Navy or Air Force in the last war who, for a small monetary consideration, would be willing to help train the young entrant or to come forward to help with territorial training.

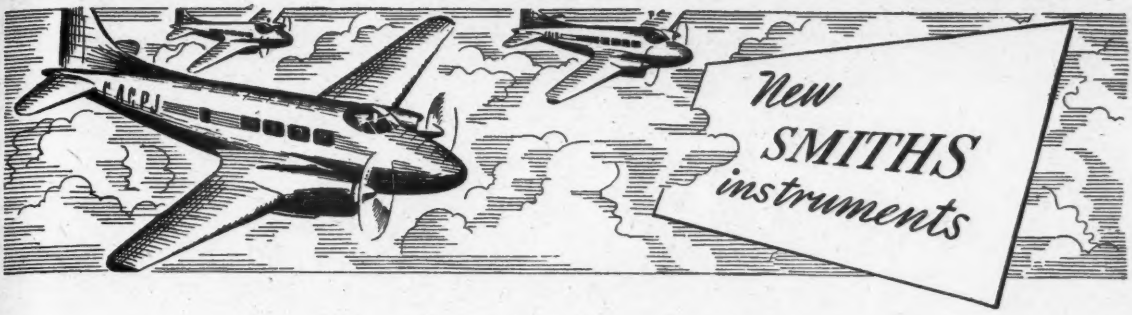
MR. GALLACHER reminded the Minister that in 1937 he was kind enough to give him a lift in his car and take him to the Soviet Embassy to see a film of the Kiev manœuvres. That was the first demonstration of the new and very important developments in the Air Force, showing tank-carrying aircraft, parachutists and all the rest of it. Many military experts were present. Our military men, after seeing the film, said "Very interesting, but of no practical value in war."

THE PRIME MINISTER said that in the matter of secrecy, we took council with our advisers. He noticed that the Select Committee on Estimates agreed that we gave away too much in pre-war days and in too much detail. He would like to see a general disclosure all the way round, but he never saw why, in all these matters, we should always have to make a start without any reciprocity and would like some from the other side of the "iron curtain."

CONSTELLATION UNDERCARRIAGE IMPROVEMENT

RESULTING from two years' research on aircraft undercarriage problems, a new safety device has been evolved by the Lockheed Aircraft Corporation which it is hoped will effect a drastic reduction in the number of accidents attributable to overstressed undercarriages. U.S.A.A.F. statistics have shown that landing gear failures were responsible for more than one-third of all aircraft accidents during the war. These failures could not be ascribed to inherent weakness of the structure, or effects of fatigue or oleo leg characteristics since all these factors had been amply tested and proper design allowances made. It was deduced, however, that the excessive loads were due to dynamic overloading of the undercarriage at the moment when the aircraft touches down and accelerates the wheel from rest to the equivalent of the machine's ground speed in about one-tenth of a second.

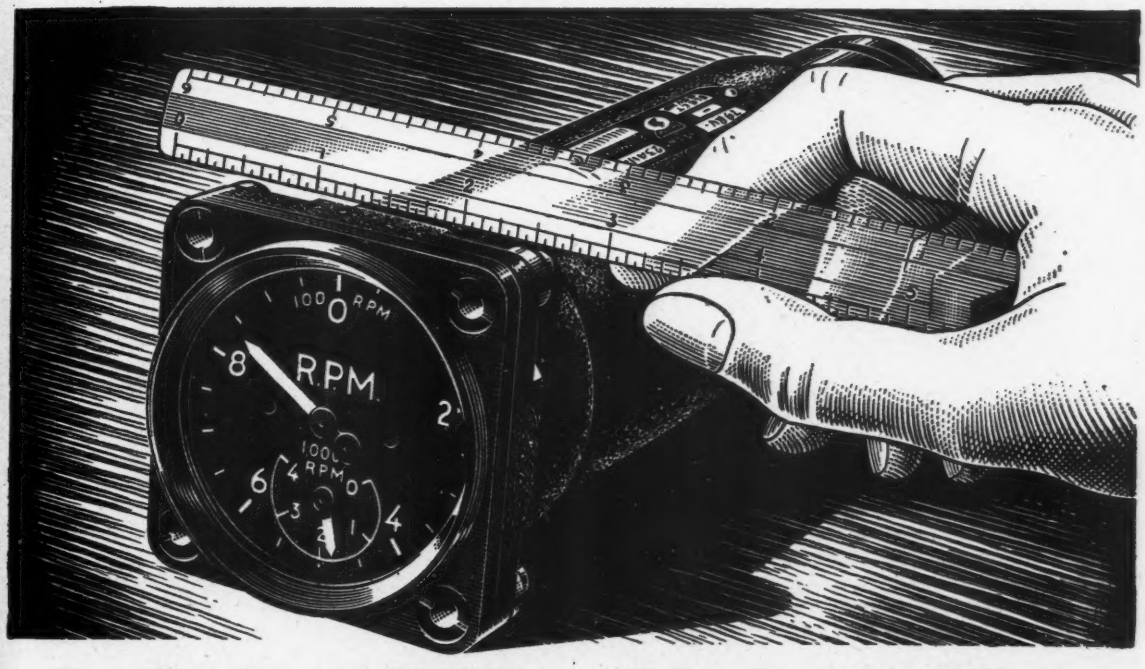
The solution of this problem eventually developed by the Lockheed Aircraft Corporation is an hydraulic damping device incorporated in the retracting mechanism which permits a rearwards movement of the undercarriage of about 6 in from the normal position. After exhaustive testing on a 40-foot drop-test tower, the mechanism was fitted to a Constellation for flight testing, which showed reduction in the lurch commonly experienced in landings. The tests, which included landing and skidding on wet runways, showed that in landings involving a sinking speed of 600 ft/min, at a forward speed of 95 m.p.h., the initial peak load was reduced by 32 per cent and the rebound to one-quarter of its former value. The improvements gained by this method of damping horizontal landing impact appear to be broadly similar to those effected by the use of articulated undercarriages fitted to a number of British aircraft during the later stages of the war.



Smiths 2 3/8" Electrical Engine Speed Indicator

A new engine speed indicator, housed in a small case, made to International standards, especially to meet the requirements of multi-engined aircraft where panel space is restricted.

Range is 800-3,500 r.p.m. Two pointers are used with open scales giving clear and accurate indication. Dial can be lettered to suit any language. Supplies available ex stock. First to fit this new instrument is the De Havilland 'Dove'. In all matters of instrument needs and problems Smiths offer close co-operation with the industry the world over—a comprehensive technical service backed by unique manufacturing facilities.



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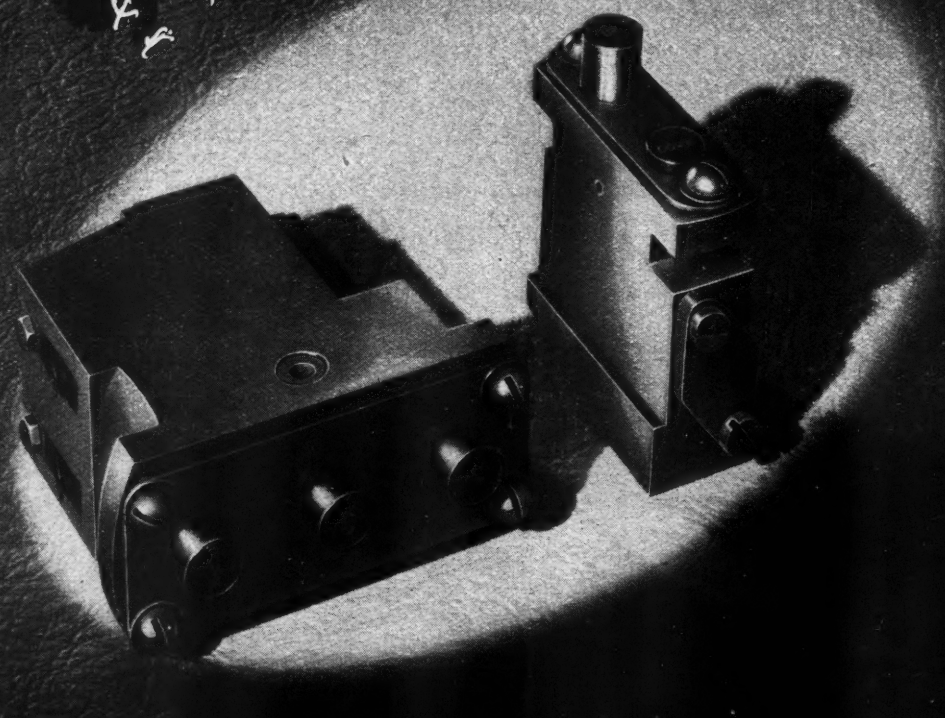


PRESS BUTTON SELECTORS

These midget selectors enable 4,000 lb. sq. in. hydraulic systems to be controlled by extremely light finger effort. The two button three way unit weighs 0.35 lb.; the three button unit, with fully interlocked buttons, is suitable for flap systems and weighs 0.45 lb. Both units use 1/8th or 3/16th inch piping.

BRITISH MESSIER LIMITED · CHELTENHAM ROAD EAST · GLOUCESTER

C.S.A. AT HOME: Two Dakotas belonging to Czechoslovakian Airlines on the apron in front of the new control tower at Prague airport. Record traffic is expected this year; the Sokol gymnastic festival will, it is anticipated, attract over a million visitors.

Committee for Air Exchange : New Chrislea Ace Flies : Design Study for Long Range Transport

ATLANTIC SERVICE POSTPONED

THE Irish Government has caused a postponement in opening the Irish transatlantic service pending a review of the expenditure involved. Aer Linte Eireann has been making preparations to open a service across the Atlantic to New York to commence on March 16th, and thereafter a thrice-weekly round-trip service, flying from Shannon to Gander and through Boston to New York on two of the services and one service direct from Shannon through Gander to New York. Already more than £20,000 worth of tickets have been sold and the announcement was made on February 27th to the complete surprise of the executives of Irish Airlines. A proving flight which was due to leave for New York on February 29th was cancelled. The decision has caused great disappointment throughout Irish Airlines, and although training on Constellations is continuing, all plans for the transatlantic service are in abeyance. If the decision is made to postpone indefinitely the transatlantic service it is not known whether the Irish Government intend to sell the entire fleet of Constellations, or maintain some or all for developing the service between London and Dublin. This latter service with the Type 749 Constellations is flying to capacity with 58 passengers four times a day in each direction. There are also two Dakota services morning and evening on the same route. In 1947, on the London-Dublin service, 65,602 passengers were carried. That service is, of course, flown by Aer Lingus. Some idea of the expansion of Irish Airlines since 1936 may be gained from the fact that 660 passengers were carried in that first year and 2,687 during 1937. There was gradual expansion until 1945, when 19,103 passengers were carried, and in 1946 there were 71,111. Last year, 132,416 passengers flew in Irish Airlines. The unduplicated route mileage has increased in the same period from 278 to 4,707.

AMBASSADOR ASYMMETRY

THE series of rules and regulations to ensure airline safety is now demanding very complete checks of a civil aircraft's behaviour in extreme conditions at and near the stall. In particular, the I.C.A.O. engine-failure requirements are such that both controllability and rate of climb in the asymmetric case must be guaranteed in all emergency take-off conditions.

Some two years ago, by way of a preliminary investigation, Mr. George Errington, the Airspeed chief test pilot, made an exhaustive series of asymmetric tests with a Vickers' Warwick used for Bristol Centaurus development. These provided valuable information to show what could be done while still retaining control in extreme conditions.

More recently the prototype Ambassador has been subjected by the same pilot to asymmetric stalling tests with flaps both up and down. The aircraft had already been put through a number of more normal asymmetric tests without showing signs of any serious depreciation in handling qualities, so a check in the more extreme conditions was not approached with any particular misgivings. With the flaps up and full power on the port engine there were no worse effects than a pre-stall warning shudder. With the flaps fully down, and using the port engine only, the starboard wing dropped at the final stall, but quite gently, for twenty or so degrees before it could be held. Equally interesting were the symmetrical stalling tests made at the same time. With the flaps up, a minimum equivalent air speed of 63 knots was reached with no worse result than the usual shudder and some considerable discomfort for the observers, since the floor angle was such that no foothold could be maintained. With the flaps down and with power equivalent to 30in (zero boost) the minimum control speed was 57.5 knots. This represents a C_L max. of 2.55.

The results of asymmetric climb measurements with the Ambassador continue to be encouraging. A recent series of six tests produced the average figures given below. The rate of climb figures quoted have been corrected to I.C.A.N. conditions and the aircraft was being flown at an all-up weight of 45,000 lb; the provisional engine installations give a take-off power of 2,400 b.h.p.

Height ft	R.P.M.	Boost In Hg	E.A.S. Knots	Corrected R. of C. ft/min	Conditions
5,300	2,700	46	106	460	Starboard prop Windmilling
10,000	2,400	34	112	260	Starboard prop feathered

In the first example the conditions are equivalent to those covering the I.C.A.O. take-off requirements, and in the second to the en route requirements at the height given. The take-off rate of climb figure may be a little higher than will normally

Civil Aviation News . . . . .

be obtained, since the starboard engine's tick-over was on the fast side and this engine would consequently not be offering all the drag to be expected in a dead-cut case.

SABENA CRASH AND G.C.A.

ON March 2nd a Sabena Dakota crashed at London Airport and 19 people were burned in the wreckage. Three were rescued, but one subsequently died. The aircraft had left Brussels at 1940 hours carrying 19 passengers in addition to the crew. On arrival at London Airport the aircraft was talked down by G.C.A., but crashed on the runway at 2114 hours G.M.T. when visibility was about 200 yards. The Ministry of Civil Aviation subsequently made a statement to the effect that G.C.A. was not a blind landing device, but was intended to guide aircraft under adverse weather conditions so that the pilot could make a visual landing. The Ministry further made clear that the ultimate responsibility, under the recommendations of I.C.A.O., for deciding whether to land at an airport rested with the pilot, who based his decision on information given to him of weather conditions at the airport, and in conformity with weather minima approved by his national authority and recorded in his operations manual. In order to prevent reliance on G.C.A. beyond its technical capacity, instructions were subsequently issued that G.C.A. would not be available in future, except in emergency, where visibility was below 150 feet from air to ground and 800 yards horizontally on the ground.

BALTIC AIR EXCHANGE COMMITTEE

AT preliminary talks in August last year a number of charter companies agreed to support the opening of an air charter section on the Baltic Exchange. The Baltic Exchange has already been made use of by some charter companies through broker members, but at a meeting held at the Exchange in February a committee was formed to examine and make recommendations on the operation of an air exchange at the Baltic Exchange. The committee was composed of the following representatives:—Mr. W. N. Cumming, Chairman of B.A.C.A.; Sir Archibald Hope, Airwork, Ltd.; Mr. Stanley Hinde, Baltic Exchange; Mr. R. T. Hughes, S.B.A.C.; Mr. R. K. Leeper, I.S.F.A.; Mr. J. Mond, Air Contractors, Ltd.; Mr. H. R. Gillman, Secretary, B.A.C.A.; and Mr. Quin-Harkin, I.A.T.A. (as observer only). The British Air Charter Association has been asked to make necessary arrangements for the committee's meetings and to supply secretarial services. Two meetings have subsequently been held, and the committee are unanimous that an air section can be set up and that the organization of the Baltic Exchange can give the operators the machinery for obtaining cargo at home and abroad. The committee advise all operators to appoint brokers to act for them in obtaining cargoes or, if they prefer, join the Exchange and have their own representatives. In view of the many detailed matters which will arise, the committee has recommended that a permanent joint committee composed of three members of the Baltic Air Section and three representatives of B.A.C.A. be created to deal with such matters as documents and conditions of carriage, the economics of air carriage, and the Civil Aviation Act, 1946.

GLIDER REQUIREMENTS

IN book form, British Civil Airworthiness Requirements Section E, for Gliders has been published by the Air Registration Board. Similar to the requirements for aircraft, described in *Flight*, January 22nd, the publication will be issued annually and the requirements applicable for each year will be associated with a particular issue number. Throughout the period in which issues remain current amendments may be published on a provisional basis to become effective at the next yearly issue date. The requirements state the minimum and constitute the basis on which recommendations to the British Gliding Association will be made.

The Air Registration Board also issued amendments and additions to other sections of British Civil Airworthiness Requirements, for insertion into the loose-leaf volume. The amendments include, Contents Issue 12, a general foreword Issue 8, and new sub-sections A.32 and A.33.

THE NEW CHRISLEA: The "first off" Series II Super Ace which has completed its maiden flight successfully. Powered by a Gipsy Major X engine the machine is priced at £1,875.

THE CHRISLEA SUPER ACE

DURING the past twelve months or so the Exeter factory of the Chrislea Aircraft Company has been busy on production of the Series II Super Ace, deliveries of which are expected to commence shortly. The "first off" recently made a successful maiden flight. The Series II Super Ace differs from the original prototype in many details, and in place of the 125 h.p. Lycoming engine a Gypsy Major X is now fitted. Mr. Rex F. Stedman, the company's test pilot, on his first flight in the new machine devoted 50 minutes to general handling, after which, being extremely pleased with the machine's characteristics, he proceeded to carry out stall investigations. The success of these then made him decide to try out the spinning characteristics, and he found that the aircraft did not spin but merely made a steep spiral turn which was immediately corrected as soon as the controls were released.

THE L.R.E. SPECIFICATION

SO much interest has been displayed in the M.R.E. and L.R.E. specifications that the scanty information available has tended to become embellished, and some misapprehension about the position may have arisen. So far as the Medium Range Empire specification is concerned, discussions are still in progress between B.O.A.C. and the Bristol Aeroplane Co., and until these have been completed no further information will be available, nor will a firm order be placed.

The main requirements of the Long Range Empire specification were announced recently, and these are as follows:—

Still air range, 4,500 miles.
Payload, 9,000 lb (typical breakdown—30 passengers plus 1,500 lb mail).
Cruising speed, 300-350 m.p.h.
Operational altitude up to 30,000 feet.

All other details are left to the designers of the aircraft concerned. Of the five major firms invited to submit designs, three have been able to co-operate.

The medium size and fairly modest performance requirements are dictated to a great extent by the stage distances and airfields over which such an aircraft would operate, but in addition to this, the accent is on economy of operation and care has been taken not to penalize certain new types of engines which are on the way by demanding performances for which they would not be suitable. It may be said, in fact, that one of the purposes behind the invitation to submit designs to this specification was to encourage manufacturers and air lines to look ahead and consider possible Empire requirements one

TRAMPS: Freighters on the tarmac at Bovingdon. The Lancashire Aircraft Corporation, resident at the airport, have recently signed a contract for flying 100 tons of cloth from Lille to London.

"Flight" photograph.

stage ahead of the immediate outlook. Whether or not one or other mark of Tudor will be able to fill the gap on the Empire routes between now and the possible production of an L.R.E. type remains to be seen. Both the Hermes and the D.H.106 also enter into the picture to a greater or lesser extent.

It must be understood that the L.R.E. is a design-study and has been initiated jointly by the Ministry of Civil Aviation and the Ministry of Supply, and has no connection with B.O.A.C. The Corporation have already indicated that they have at present no specific requirement for a long-range Empire aircraft of that type, but they have offered to give any technical assistance required by the aircraft manufacturers in producing the design.

B.O.A.C.'s JAPAN SERVICE

THE first British civil air service between the U.K. and Japan is due to begin on March 19 when B.O.A.C. will extend their existing flying-boat route from Hong Kong to Iwakuni, near Kure, Japan. This extension adds 1,363 miles to the route, making a total distance from Poole to Japan of 10,625 miles. The journey will take seven days in Plymouth flying boats, which will carry 22 passengers besides mail and cargo. The service is planned to operate once a week in each direction, the fares being £214 single and £385 return. Night stops will be made at Augusta, Cairo, Karachi, Calcutta, Bangkok and Hong Kong.

BREVITIES

Northwest Airlines have ordered a further 15 Martin 2-0-2 36-seater transports. The new order will bring the company's 2-0-2 fleet to 25. Deliveries are expected to be completed by June.

* * *

Owing to unforeseen circumstances the Royal Aeronautical Society has found it necessary to postpone the full-day discussion on Safety in Civil Aviation arranged for Saturday, April 3rd, as announced in *Flight*, January 1st.

* * *

As from June 1st Pan American Airways will fly two aircraft daily between New York and London, 11 a week to Prague, 10 to Brussels and Frankfurt, and seven to Vienna. The New York-Bermuda services will also be increased to 10 a week.

* * *

It is understood that the single prototype Vickers Viscount will not be powered with Mamba engines. The original scheme was to build three prototypes, each one powered by different airscrew turbines, Dart, Naiad and the Mamba.

* * *

Candidates for the examinations for flight navigators' and civil aircraft navigators' licences are advised that a knowledge of the provisionally agreed I.C.A.O. Symbols, contained in Notice to Airmen No. 16 of 1948, Appendix I, will be required on and after April 12th, 1948.

* * *

The installation of high-intensity contact lights on runway 100/280 at London Airport is to be completed and work has already recommenced. Delays of up to 30 minutes may occur when landings are necessary on that runway, to allow contractors' equipment to be removed.

* * *

On March 24th and 25th and on March 29th and 30th the B.E.A. service between London and Jersey and between Southampton and Jersey will be doubled. The Liverpool-Isle of Man services will be increased by an extra return service on March 24th and 25th, and on April 1st and 2nd.

* * *

K.L.M. have announced an increase of 30 tons in the weight of air mail carried during 1947 on the Amsterdam-Curacao service. Eighteen transatlantic flights will be made each week by the Dutch company during the coming summer, including two services a week from Amsterdam through New York to Curacao.

Aircraft marshalling at London Airport is now the responsibility of the Ministry of Civil Aviation. The arrangement is different from normal airport procedure, since operators are usually responsible for the tarmac movements of their own aircraft. The M.C.A., however, consider that future traffic conditions will require specialists on the tarmac.

* * *

The Civil Aeronautics Board have raised the present minimum altitude for visual day flight and for instrument and night flight in mountainous areas for all American scheduled and non-scheduled air operators. By day in V.F.R. conditions the clearance has been raised from 500 to 1,000ft, and by night in similar conditions in unlighted areas from 1,000 to 2,000ft; the same clearance applies in I.E.R. conditions.

* * *

Skyways' scheduled services between Nairobi and Mauritius operate southbound on Saturdays, leaving Nairobi at 0545 hrs and arriving at Mauritius at 1630 after a stay of 45 minutes at Dar-es-Salaam. The return journey is made on Sundays, departing from Mauritius at 0700 hrs and, after an hour at Dar-es-Salaam, arrives at Nairobi at 1600 hrs. Connection is made at Nairobi with the B.O.A.C. southbound service which leaves the U.K. on Wednesdays and the northbound service which arrives in the U.K. on Wednesdays. The through fare is £56 7s single and £101 8s return.

* * *

The replacement of Douglas Dakotas by S.E.161 Languedoc aircraft on Air France routes is proceeding more rapidly than was anticipated, and by the middle of February these aircraft were operating on the Paris-Lyons-Marseilles and Marseilles-Algiers routes, as well as on the Paris-London and Paris-Prague routes. Languedocs are to be used on the entire European based network, and the introduction of these French aircraft has resulted in changes in schedule, as for instance on the Paris-Prague service, where flying time has been reduced by thirty minutes to three hours and ten minutes.

* * *

Sir J. D. Cockcroft, director of the government atomic energy research station at Harwell, Berks, said recently that at least 20 years would be needed to solve technical problems of nuclear power units which would contribute to our fuel supplies. Sir John, who was addressing the north-eastern branch of the Institution of Mechanical Engineers, said that the application of nuclear energy to power units was limited by the weight of shielding required to protect operators which might amount to 100 tons for a unit of a few thousand horse-

Civil Aviation News . . . . . .

power. This indicated that ships would be a more favourable field of application than air or road transport.

* * *

A new restaurant with accommodation for 180 guests has recently been opened by B.E.A. at Northolt airport. Breakfast costs 3s 6d, lunch or dinner 5s. Attached to the restaurant are a lounge and cocktail bar, which is open at normal licensing hours. The facilities are available for passengers, their friends and all authorized visitors, but not for visitors to the M.C.A.'s public enclosure.

* * *

Further efforts are being made to persuade the Ministry of Civil Aviation to provide an airport for North-East England. A site at Boldon, south of the Tyne, has been approved by the M.C.A., but it has indicated it is unlikely that work will be started for some years, and at the same time has refused a grant to extend Newcastle airport. The North-Eastern Airport Joint Committee are gathering statistics and a fresh approach will be made shortly through the northern group of M.P.s.

* * *

A questionnaire conducted among 1,000 passengers travelling by A.O.A. from Britain and Europe in a recent four-week period, revealed that nearly half the number—42 per cent—did not intend to return. Only 18 per cent were officially classified as emigrants; the greater proportion were women and 11 per cent of the travellers were flying to U.S. to be married. Not all the outward-bound passengers were making the U.S.A. their final destination; some were going on to Canada and others to Australia and New Zealand.

* * *

More than 90 representatives of B.O.A.C. establishments throughout the U.K. attended a meeting of the National Joint Council for Civil Air Transport. Mr. Whitney Straight, chief executive of B.O.A.C., made a statement of policy and plans and gave details of how these applied to local establishments. Mr. G. Hitchings, of the A.E.U., chairman of the meeting, stated that the machinery was working and there was good response to the idea of the Joint Council accepting responsibility for the harmonious and efficient working of civil air transport as a whole.

* * *

Panair do Brazil, part of the Pan American World Airways System, flew over 109 million passenger miles during 1947. The number of passengers carried, 140,000, exceeded the previous year's total by 20,000. The figures for ton-miles of baggage, mail and freight flown were 3,067,795 on domestic services and 2,886,048 on transatlantic services, making a total of 5,953,843.

* * *

American Overseas Airlines have begun a regular air service between Frankfurt and Berlin; this is the first time Germans have been allowed to fly as mark-paying passengers on commercial airlines since the end of the war. During the first week in which bookings were open nearly 2,000 Germans applied for passages to Berlin.

* * *

During the last week of February a record weight of air-freight for export was handled by B.O.A.C.'s traffic handling unit at Airways Terminal. Altogether 4,000 consignments, weighing over 40 tons, were despatched to destinations all over the world. Among these exports orchid plants, some of which are valued at £500 each, were sent out to many countries, particularly the U.S.A., where they earn dollars for Britain.

* * *

According to the latest figures Air France employ a total of 9,592 personnel; 946 in flight duties and 8,646 on the ground. The flying personnel consists of 306 pilots and assistant pilots, 223 radio operators, 214 engineers, 23 navigators, 29 pursers, 70 air hostesses and 81 stewards. Among those on the ground 91 are engaged on direction and management, 1,086 in administration and 4,255 in technical and maintenance work.

* * *

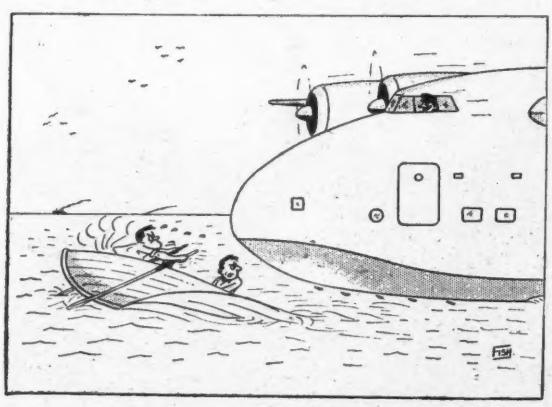
Advance air bookings in the U.S. indicate that many Americans are coming to Britain this year. During January alone B.O.A.C.'s New York office reserved some 600 transatlantic passages for the spring and summer, June being the peak month. Approximately £62,200 worth of tickets have been sold. Besides bookings for American tourists to Britain, B.O.A.C. and South African Airways have sold about 750 tickets to Britain, for the coming season.

FROM THE CLUBS

DURING the past month the British Association of Aviation Clubs has been exceedingly active, and to date 31 clubs have been formed, including five in Holland. Since February 7th clubs have been formed in the following districts: Cambridge, Southall, Wolverton, Hove, Cheam, Bristol, West London, Preston, Wimbledon, Norwood, Great Yarmouth and Grimsby. In addition, the 36th Troop Croydon Air Scouts and five Dutch Sky Observer Clubs have been formed.

* * *

Undeterred by Lord Nathan's inability to assist, the Herts and Essex Aero Club is determined to carry on, fortified in the recollection of over 3,000 hours flown during 1947 and the continued enthusiasm of its members. Various flying competitions are to take place during the coming season and the Broxbourne Gold Badge is to be revived for the pilots with a minimum of 100 hours solo who pass the Chief Instructor's test based on the "B" licence standard. Through the generosity of members, A.T.C. cadets from the Leyton Squadron are to be given a series of trial flying lessons. The hours flown in January totalled 83 and during February 102. All the club's Tiger Moths and two of the Austers have now had their C's of A renewed in the workshops and the third Auster is now being prepared in readiness for the summer.



"Keep it up Fred. She's nearly airborne."

* * *

The 31st annual general meeting of the Midland Aero Club was held on February 25th, at which Mr. W. H. Sutcliffe was elected president, Mr. D. S. Scoffham, D.F.C., was elected secretary, and Mr. T. C. Pepper treasurer for the coming year. Mr. A. J. Penser and Mr. M. V. Desmond were appointed to the Committee. The chairman in his report stated that the club had now purchased a three-seater Autocrat which made the fleet up to five machines in all. The membership had practically doubled since last year and the flying hours had shown a considerable increase. It was suggested after the meeting that the heavy charge for hangar space of £9 per month per aircraft should be investigated and representation made to the Ministry for some reduction in this very heavy cost on the flying charges.

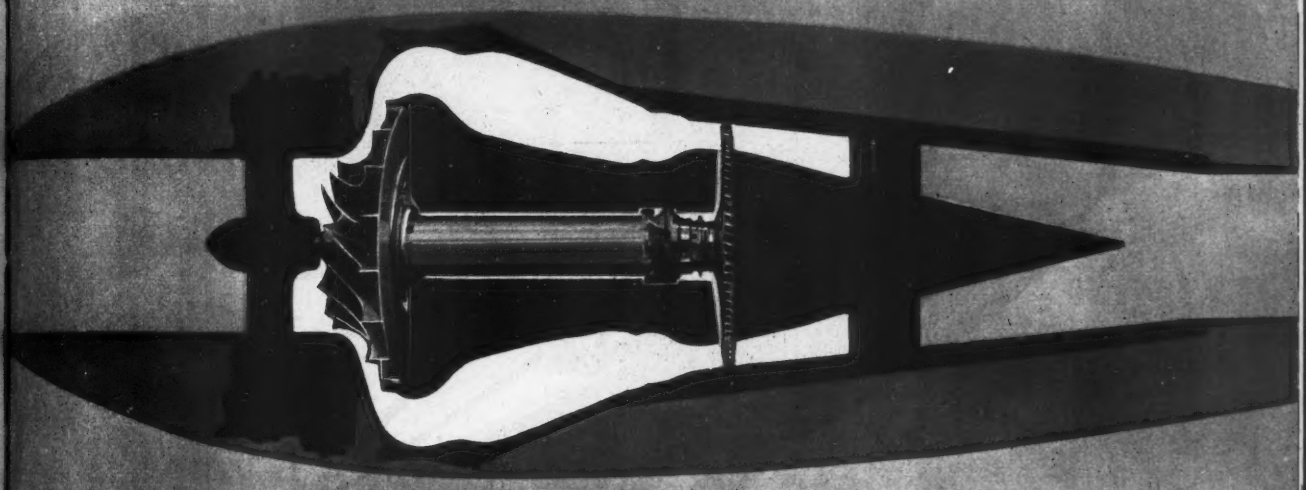
* * *

Although the Coventry Aeroplane Club logged only 170 hours' flying last year they have high hopes, weather being favourable, of increasing their total to 600 this year. The chairman, Mr. H. M. Woodhams, made this observation when, in reviewing the work of the past year, he commented on the club's improved prospects. In 1947 two Tiger Moths had been purchased and a third was expected shortly. Referring to the purchase of a Link Trainer, the chairman said he felt sure that few clubs in the country were as well equipped as they were at Coventry. A suggestion had been made to form a gliding section and the equipment for this, although costly, could be obtained if adequate hangar space became available. The club's post-war effort started with assets around £400 and today they amounted to at least £800 and the two aircraft. Mr. F. Martin, who was re-elected secretary, said that it was hoped to increase the membership, which now stands at 92, to 130. Other officers elected were: President, the Mayor of Coventry; Vice-chairman, Mr. C. K. Turner-Hughes; assistant secretary and treasurer, Mr. D. G. Adams.

THE DE HAVILLAND PRINCIPLE

of the

SINGLE-SIDED IMPELLER



1. Direct entry to impeller eye with maximum ram effect and small ducts.
2. Minimum diversion of gas flow.
3. Low r.p.m. for a given compression ratio, making for good turbine design.
4. Single rigid rotating component for simplicity, lightness and smooth running; balanced thrust minimises bearing loads.
5. Low overall diameter due to close-fitting, unpressurised cowling; cowling is light and quickly detachable, providing good accessibility.

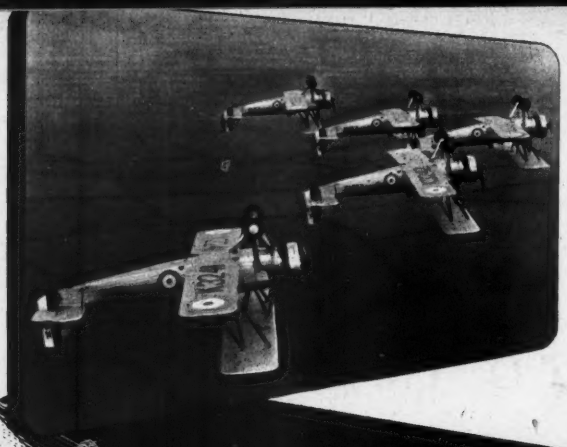
DE HAVILLAND JET ENGINES

for

MAXIMUM INSTALLED EFFICIENCY

No. 5

Do you remember



After the '504' came the Avro Tutor. Here is a photograph of the classic exhibition of upside-down flying by instructors of the Central Flying School at the R.A.F. displays of unforgettable memory.

and now — the Avro Athena trainer

Chosen in 1932 after long and fierce competition, the Avro Tutor was a standard trainer until the War days. Now comes the Avro Athena, built to Air Ministry specification, with the Avro trainer's tradition behind it and all Avro's experience of thirty-five years in this specialised field.

A. V. ROE & CO. LIMITED
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POLAR LANCASTERS

Scenes from a Training and Research Flight Into the Arctic Circle by Aircraft of the E.A.N.S.

THE recently completed Gibraltar-Iceland-Arctic Circle cruise by seven Avro Lancasters (Rolls-Royce Merlin engines) of the Empire Air Navigation School, was productive not only of technical data but of some splendid photographs, a selection of which appear here. Furthermore, it served as a reminder that there is plenty of life yet left in a bomber which is already history.

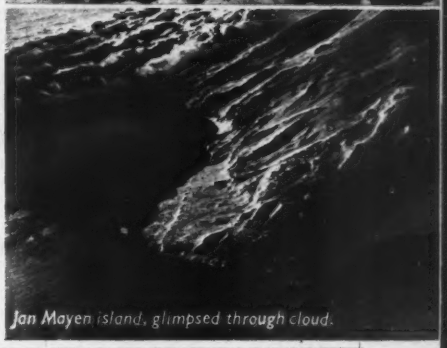
Taking off from their base at Shawbury in spring-like weather, the Lancasters headed for Gibraltar where fuel and bananas were taken aboard. Thence they set out over the Atlantic to the friendly Icelandic capital of Reykjavik. Here Mr. S. Baxter, the British Minister, had arranged a reception for the crews before they left on the final non-stop stage of their flight over the desolate Jan Mayen and Bear Islands, within 900 miles of the North Pole. Temperatures of −25 degrees centigrade were recorded over Bear Island, but the crews are reported to have described their arrival at Shawbury as "the coldest part of the trip."

Comprising students of No. 5 Specialist Navigation Course, the crews totalled forty-two officers and twenty-four senior N.C.O.s. The purposes of the flight were to establish an effective polar navigation drill, using standard Service equipment; to collect information on weather and signals; to investigate any arctic phenomena which might manifest themselves and to acquire experience with long-range radio aids and pressure pattern flying.

By taking continuous advantage of favourable winds, a distance of 2,200 miles, which would normally have occupied 11 hours, was completed in 10¼ hours.

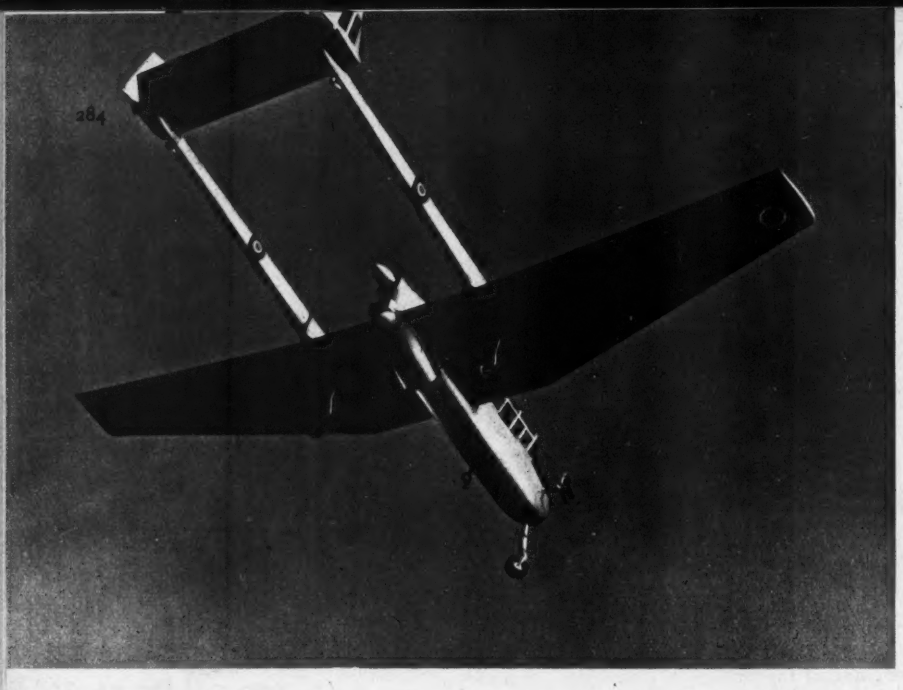
Of the seven aircraft engaged on the flight five landed at Kinloss, on their return flight to Shawbury, the other two withdrawing from the last section of the exercise, one at Reykjavik with electrical and radio defects, and the second with an oil leak in one engine. These aircraft proceeded independently and returned safely to Shawbury.

Seething cloud obscures the Arctic ice.



Jan Mayen island, glimpsed through cloud.

Lancasters at Gibraltar, awaiting take-off for the long hop to Reykjavik.



The Heston Artillery Observation Post

ARMY CROW'S NEST

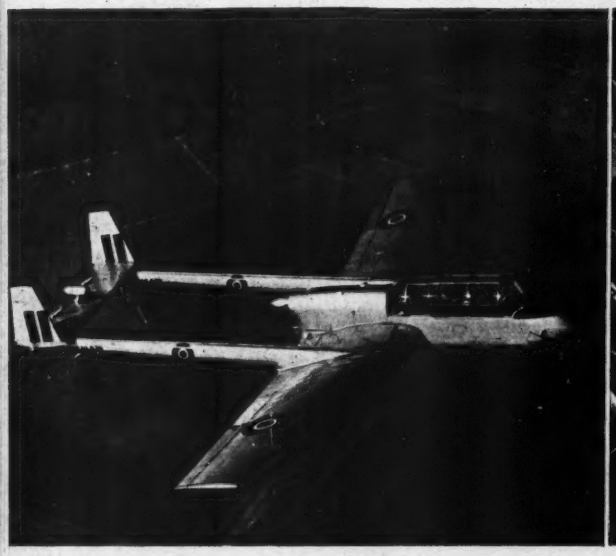
THESE first air-to-air photographs of the Heston A.2/45 A.O.P. bring out particularly well the unusual layout of this interesting specialized aircraft. As the result of present economies, the Army is unlikely to place an order for the time being, but two of the four machines originally ordered—the prototype here depicted and the second now nearing completion—will be built, tested and developed, and then the design will be held in readiness for immediate production should a need arise. The "A.2" is fortunately of a type less likely to grow obsolete in the next few years than most military aircraft.

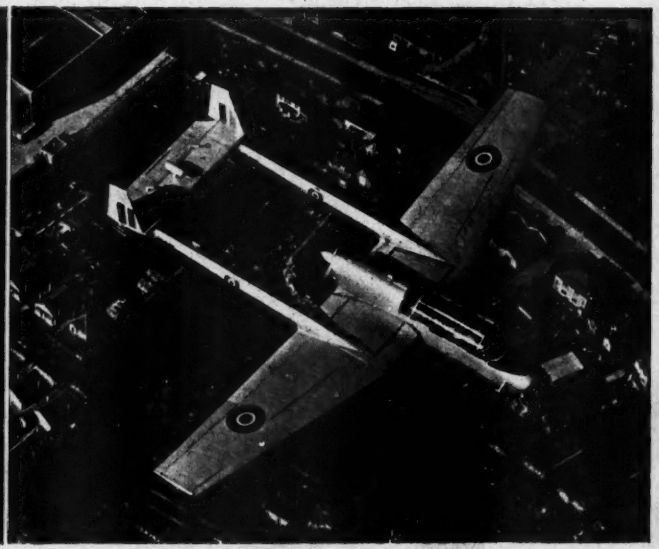
In order to carry radio and other equipment demanded in the Army specification, and also an observer (whose precise function is somewhat obscure, unless it is as pilot's companion and rear lookout), the A.O.P. has been made larger than previous aircraft fulfilling a similar function. Efforts might be made to reduce the size in any later specification. The span is 44ft, the length 34ft, and the wing area 274 sq ft.

Cooling during ground running was at first something of a problem with the Gipsy Queen 33 pusher installation, particularly as the A.O.P. must be suitable for tropical as well as Arctic conditions. An early extractor-fan system around the spinner has now been abandoned, and the D.H. c.s. airscrew itself draws air satisfactorily through the outlet grill and thereby causes adequate circulation. Air enters through a scoop below the nacelle.

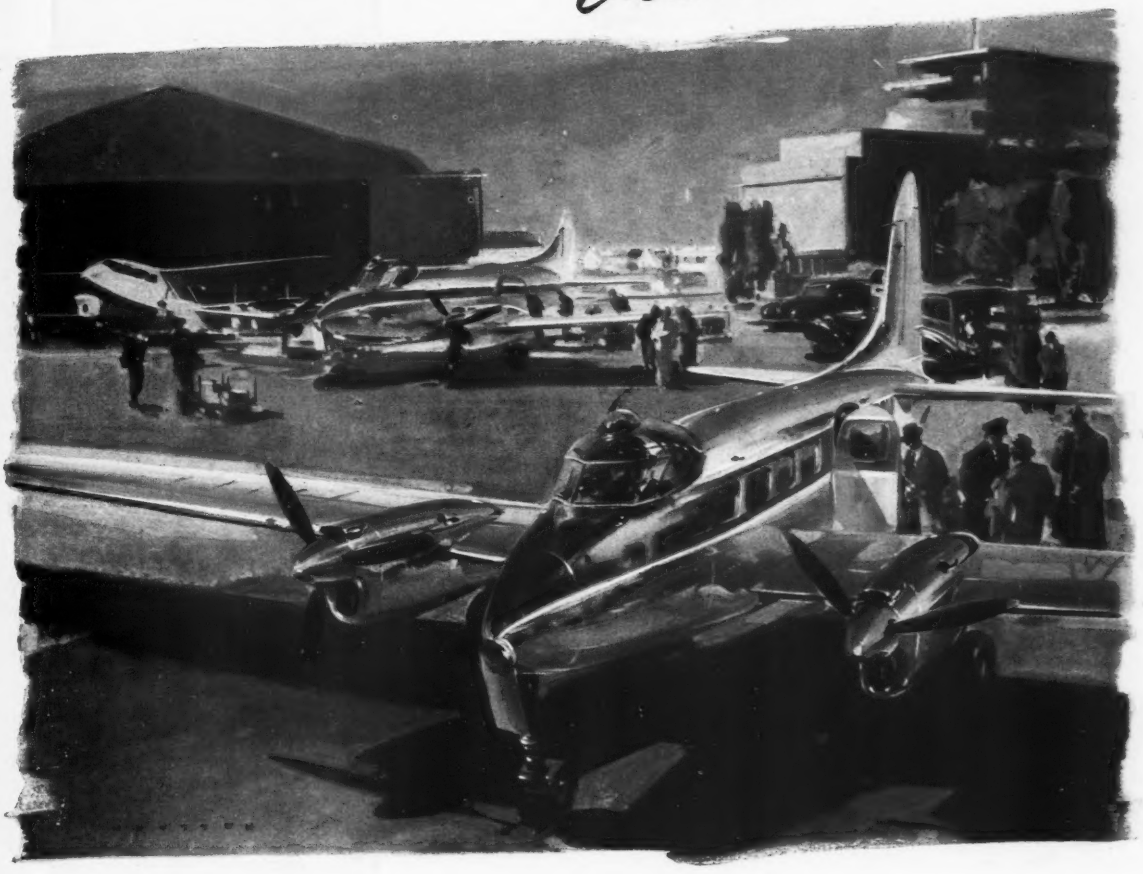
Development flights are proceeding with Mr. Ralph Mundy at the controls, and complete stalling tests have recently been commenced. An unexpected and unwelcome characteristic—the need to hold-up one wing and apply rudder towards it as speed was reduced towards the stall—was eventually traced by tufts to slight damage to the inside surface of one of the slats. The fault has been rectified, and the aircraft is handling very well indeed.

These and other photographs were taken recently by one of *Flight's* photographers installed in the rear seat of a Tiger Moth. Taking off more or less together from Heston airfield (now closed to traffic) the A.O.P. and Tiger Moth climbed side by side gaining height until the London haze was topped at 2,500ft. The A.O.P. appeared to climb comfortably at reduced power at 65 to 70 m.p.h. Such is the approach speed and rate of descent of the A.O.P. that for the photographs with flaps down it was necessary to throttle the Tiger right back and to put the nose well down from a speed of about 55 m.p.h. By the time the photograph had been taken the Tiger, gliding at 70 m.p.h., was running away from the A.O.P. even though the A.O.P.'s Gipsy Queen could be heard buzzing at something approaching half-power.





The Dove has been chosen for Charter operation



Six of the operators who have selected the Dove for charter services.

Olley Air Service Ltd.

Chartair Ltd.

Skyways Ltd.

Westminster Airways Ltd.

Morton Air Services Ltd.

British Air Transport Ltd.

Reliability, comfort and economy—the first essentials of all air transport—are provided in the Dove in full measure.

In addition, the charter operator needs competitive performance, unusually comprehensive navigational equipment, the highest handling qualities for take-off and landing at small or unfamiliar airfields under widely differing conditions of operation, and simple, cheap maintenance. The Dove has these qualities.

D O V E

THE DE HAVILLAND AIRCRAFT COMPANY LIMITED · HATFIELD · HERTFORDSHIRE · ENGLAND

Original "Flight" Colour photographs by John Yoxall

ROYAL AUXILIARIES

"Flight" Salutes a Gallant Fighting Force, Proven in War, Persevering in Peace. Now Honoured by the Grant of the Prefix "Royal" to Its Illustrious Name—The Royal Auxiliary Air Force. On These Pages the Force is Represented Pictorially by No. 615 (County of Surrey) Squadron—"Winston's Own"

AT an Auxiliary Forces Exhibition in Glasgow, Marshal of the Royal Air Force Lord Tedder, Chief of the Air Staff, recalled the days of the "wapinschaw"—a parade, as he described it, of the local "home guard" to see that each man was armed in accordance with his rank and ready to take the field when required. 'At no previous show of arms on Glasgow Green," he said, "before Bannockburn, during the 'Forty-Five,' or in 1939, has such good equipment been available for our wapinschaw. One has often heard the phrase 'give us the tools and we will finish the job'; here the position is reversed—here are the tools—it is up to us to find the men. the hands and the brains."

What the C.A.S. had to say of the Scottish Auxiliaries holds good for all Royal Auxiliary Air Force Units throughout the country—the Flying Squadrons, the Air Defence Units, and the R.Aux.A.F. Regiment Squadrons. This year some of the Flying Squadrons are likely to be issued with 540-m.p.h. Vampire jet fighters, capable of speeds over 100 m.p.h. faster than the Spitfires and Mosquitoes at present in service.

Brought into being in 1924 as the Air Force counterpart of the Territorial Army, the Auxiliary Air Force, as it then was, comprised a number of first-line units having a territorial connection with the counties or cities in which they were formed. Volunteers were recruited to give part-time service, and the County Associations, which administered the Territorial Army Units, were asked to assume a similar responsibility for the A.A.F.

The first four squadrons were formed in 1925, two in London, the others at Glasgow and Edinburgh. A fifth, in Warwick, followed a year later, and squadrons in the North Riding, Middlesex and Durham were formed in 1930. Units representative of the West Riding, Cheshire and West Lancashire were established in 1936, and the Special Reserve Squadrons which had been raised in Kent, Gloucester, Nottingham and Northern Ireland were absorbed. In the last three years of peace other squadrons came into being in Aberdeen, Glamorgan, Surrey, South Yorkshire and Manchester. During the '30s, moreover, Auxiliary Ground Units for balloon duties were formed

Last year, for the first time since 1939, squadrons of the R. Aux. A.F. attended Summer Camps at R.A.F. stations specially chosen for their training facilities. Here are sunny scenes from the camp of No. 615 Squadron at Horsham St. Faith. near Norwich.

The Commanding Officer of No. 615 (County of Surrey) Squadron, R.Aux.A.F., in his Spitfire 21.

ROYAL AUXILIARIES . . .

throughout the country, and on the outbreak of war the A.A.F. comprised twenty Flying Squadrons and more than forty Balloon Squadrons.

Called out for operational service as part of the first-line strength of the R.A.F., these units served throughout the war with great honour. Inevitably they were robbed of some of their "territorial" character, but this precious link is fast strengthening as the R.Aux.A.F. swings into its stride.

After the war the twenty Flying Squadrons were withdrawn from R.A.F. service and reformed for part-time duty at their pre-war bases. They were reconstituted on the basis of 13 day-fighter, three night-fighter, and four light-bomber squadrons, but lately all units have been given a fighter rôle.

As operational requirements changed and the Balloon Squadrons were disbanded, the structure of the non-flying part of the Force was modified, and it was decided to establish a number of Air Defence Units, located throughout the United Kingdom. At the outset of a war the task of these units would be the working of the fighter control and radar reporting system of the country. Further plans involve the formation of twenty Auxiliary Regiment Squadrons, to be based with and trained with the Flying Squadrons and to undertake, with their Bofors guns, anti-aircraft and airfield defence.

Readers who desire information on conditions of service, etc., in the various branches of the R.Aux.A.F. should apply to the Squadrons, or to the County Territorial Army and Air Force Association offices throughout the country. Applicants must have served with the R.A.F. during the war. Apart from the flying side, there are vacancies in ground trades and for technical, medical, administrative and equipment duties. Flying personnel receive an annual retaining fee, and there is a yearly bounty for airmen in the ground trades. Pay is issued during periods of continuous training, and training expenses are allowed during periods of non-continuous training. Officers are commissioned for five years and airmen sign for four years. Members must carry out a specified amount of training each year, undertaken during the evenings, at week-ends and at the annual fifteen-day camp.

Royal Auxiliary Air Force Flying Squadrons

No. 500 (COUNTY OF KENT), West Malling. Hon. Air Commodore The Rt. Hon. Anthony Eden, M.C., M.P. C.O. : S/L. Patrick Green, O.B.E., A.F.C.

No. 501 (COUNTY OF GLOUCESTER), Filton. Hon. Air Commodore : Air Chief Marshal H.R.H. The Duke of Gloucester, K.G., P.C., K.T., K.P., G.C.B., G.C.M.G., G.C.V.O. C.O. : S/L. T. James.

No. 502 (ULSTER), Aldergrove. Hon. Air Commodore : A. Cdre. The Most Hon. The Marquess of Londonderry, K.G., P.C., M.V.O., T.D. C.O. : S/L. W. H. McGiffin.

No. 504 (COUNTY OF NOTTINGHAM), Hucknall. Hon. Air Commodore : A. Cdre. The Rt. Hon. Lord Sherwood of Culverton, J.P. C.O. : S/L. A. H. Rook, D.F.C., A.F.C.

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MORE ABOUT TUDORS

The Atmosphere at Chadderton : Modifications : B.O.A.C. MK. IVB. : Other Marks

ONE hardly dares to mention the name "Tudor" for fear of being associated with the regrettable and unseemly exchanges which have recently been heard in high places. It is doubly unfortunate that this important class of British aircraft, which has already had troubles enough to surmount, should now be drawn into a quasi-political slanging match. So much has taken place, and so little reliable information has emerged, that the public interest has been led from curiosity to wonderment, from surprise to bafflement, and, finally, to complete confusion.

Most ordinary people (who are footing the bill but, of course, have no say in the matter) would still rather like to ask "Are Tudors good or bad; who has the ability to judge; and has anyone the authority to do anything about it one way or another?" On the occasions when someone has dared to ask such questions others present have looked slightly horrified at such a display of ignorance, but have, nevertheless, carefully avoided having to express an opinion or answer the questions themselves.

After more than a year of argument, mind-changing and, in particular, buck-passing, there is little in the way of concrete fact on which to base an opinion.

About twelve months ago *Flight* paid a visit to Manchester to see how the Tudors were progressing and to try to straighten out a few points for ourselves. We came away, then, feeling both calmed and encouraged, though not much wiser on policy matters. Last week we paid another visit to the A. V. Roe factory and returned with similar feelings. There is no doubt at all that all the wrangling has had a most depressing effect on the staff at all levels. No one can work month after month with the thought in the back of his mind that some individual or committee may overnight decree that his previous year's work is to be scrapped or forwarded to the nearest jumble sale.

Nevertheless, one cannot help noticing and admiring the air of resigned patience which the Avro staff displays, whether test pilot, draughtsman, or one of the men who is changing the colour of the upholstery for the third time, or replacing the extra lavatory where the diplomatic mail locker was going to be before it was substituted for the engineer's panel. Amidst such frustration it is surprising to find a quite cheerful attitude of "Let all of them get on with their talking; we shall turn out a good aircraft yet, if not with their help, then in spite of them."

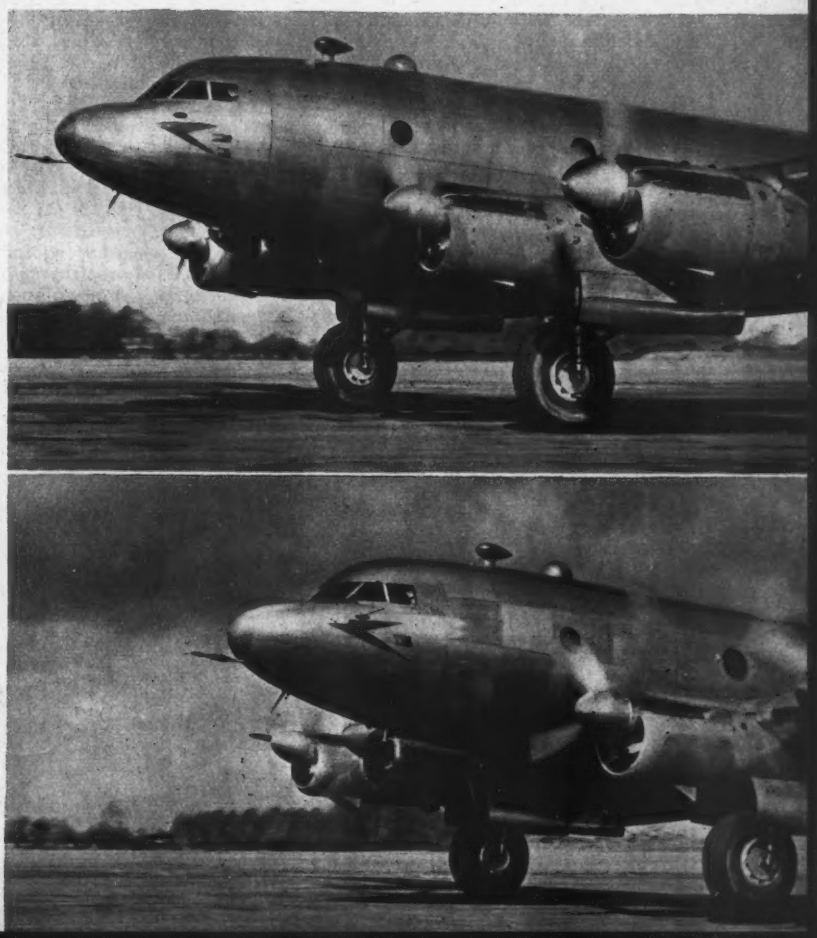
Conversion of Mk. 1s

So far as Tudor Is and IVs are concerned, a recommendation has been made that only Mark IVs be operated, and that existing B.O.A.C. Is therefore be converted into IVBs. Preliminary work has been started, but a final decision by the M.C.A. is awaited. Almost certainly this will not be forthcoming until the Tudor I from Boscombe returns from its Khartoum-Nairobi proving flight, the *Star Tiger* enquiry is completed, and all information from Boscombe, where there are two other Tudor IVs, has been examined.

Airframe design now seems to have been crystallized, and performance is satisfactory. Further trial operations on transocean and Empire routes are now required to show whether commercial operation can be practical and economical. The present grounding of the machines delivered to B.S.A.A. seems rather pointless, even as "a measure of prudence." More examination at Boscombe, tapping of wheels and shaking of tailplanes, is most unlikely to throw any light on the loss of *Star Tiger*. What is required in order to remove grounds for criticism is to get other IVs airborne on a few proving flights, to fill in the stage of experience that A.V-M. Bennett is alleged to have by-passed. If no deficiency is revealed, as is most probable, then the Tudor IVs should be put back into operation as soon as possible in order to build up more experience and to earn their keep.

While more Tudor IVs are being turned out, it is good policy to use completed Is for training. Three are now being supplied to B.O.A.C.

Recalling for a moment the many modifications, it may be said that, although the Tudor is still "young" to have experienced airline operation, growing pains are now about over. An examination of a Tudor in which the latest modifications have been embodied, and a perusal of the list of its 392 modifications, reveals that the aerodynamic changes are few but important. Visible alterations since prototype days include the tailplane, fin and rudder, all of which are re-styled and increased in area; the lengthened inboard engine nacelle tail fairings; shortened centre-section flaps; the reduced undercarriage



Comparative views of the Tudor I with (above) the original long, and (below) the shortened undercarriage.

MORE ABOUT TUDORS . . . .

length (this does not apply to the experimental Mk. VII which, with Hercules engines and their centrally disposed airscrew shafts, requires the original length of leg to give ground clearance); and the improved wing-root fillets.

Most recent of the modifications in this class, which are still being incorporated on some of the Tudors at Woodford, are a smaller and neater root fillet on the wing trailing edge, and a new small fairing on the wing-root leading edge. In addition, the leading edges of the mainplanes are being replaced with nose strips carrying flush-fitting de-icing elements. It is difficult, visually, to detect much difference between new and old; however, fewer rivet heads and an exceptionally smooth finish over and between the de-icing elements will be seen in future. Improved manufacturing processes have been introduced for the panels which fair engine nacelles into wing leading edges. These are now neater and much better fitting. One effect of these aerodynamic alterations has been to delay the onset of the stall by as much as 30 knots.

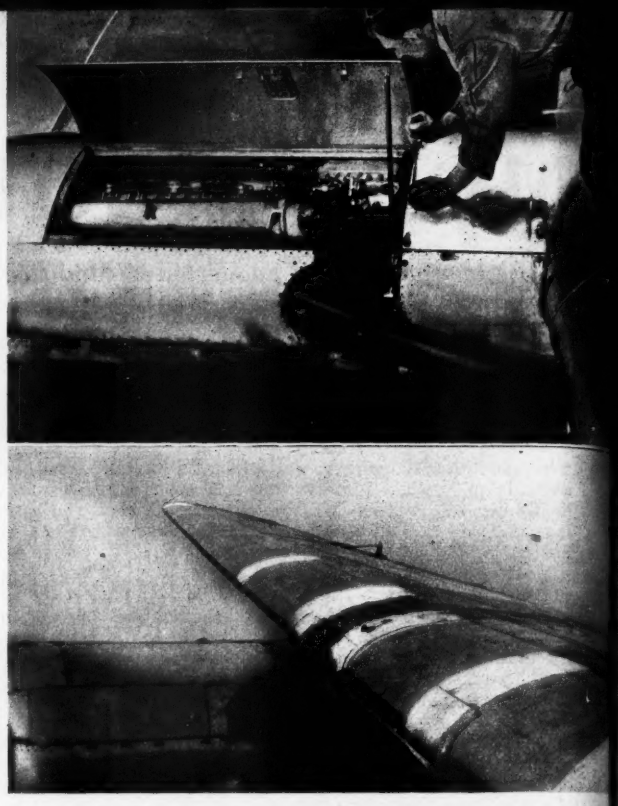
A large number of minor modifications are concerned with safety precautions. For example, an outside handle for opening the emergency exits; drip trays for all hydraulic and other joints situated above sound-proofing material; extension of the de-icing system; provision of an anti-icing shroud on servo controls; an extra oxygen point for the crew; covers for all oxygen points; and a number of other small covers, shields and guards. A disproportionately large number of modifications are concerned with the cabin-heating system, and the heater is an item which has even now to be finalized.

New Mark for B.O.A.C.

For B.O.A.C. a newly introduced mark of the Tudor type 688, the IVB, is now being prepared. This is a conversion of the Tudor I, and though similar to the B.S.A.A. Mk IVs, the main characteristics of which are well known, there are a number of important differences. The conversion itself entails 13 major modifications to the Mk I, the chief of which is the extension by 6ft of the flight-deck section. This entails the addition of new stringers, formers and skinning, and an extension of the present flooring and controls. The existing B.O.A.C. Tudor I crew and deck plan remains, and a flight engineer will be carried in addition to the second pilot. There will be a forward freight compartment with a large outside door, as in the Tudor IV, and the light-luggage hold will be converted into a diplomatic mail locker with double doors and a Yale lock. The cockpit remains unaltered except for being brought up to the full modification standard.

Seating layout will be similar to that of the Tudor IV, and the arrangement of windows will therefore have to be changed to the 2ft spacing plan; one new escape hatch will be introduced over the centre section, and two new windows added forward. There will be three toilets, and service tables at the entrance door as fitted on the latest IVs. A third J-type dinghy (two are already carried in the wings) will be housed in the cloakroom. Except for modified stowage to suit B.O.A.C. crockery, and the increased number of passengers, the galley will be similar to that on the IV.

Upholstery is to be ripped out and interior decoration and trimming will be made to conform in colour with the standard B.O.A.C. scheme, i.e., upper wall, buff vynide; lower wall, brown vynide; carpet, mottle blue; seats, blue wool rep. Increased-capacity cabin blowers will be fitted, but in the main the pressurization system will be like that on the B.S.A.A. Mk IV. Westland-designed valves and other equipment for the pressure system have proved satisfactory and have remained unaltered from the start. A new Janitrol spray-type heater will be fitted. All the radio equipment will have to be replaced to suit the new routes.



(Top) Noise level in Tudor cabins has been greatly reduced by the fitting of short exhaust pipes on the inboard side of the Merlins. Improvements have also been made to the panel which the fitter is seen attaching. (Below) Testing flow of de-icing fluid from the new, aerodynamically improved leading edge of a Tudor IV.

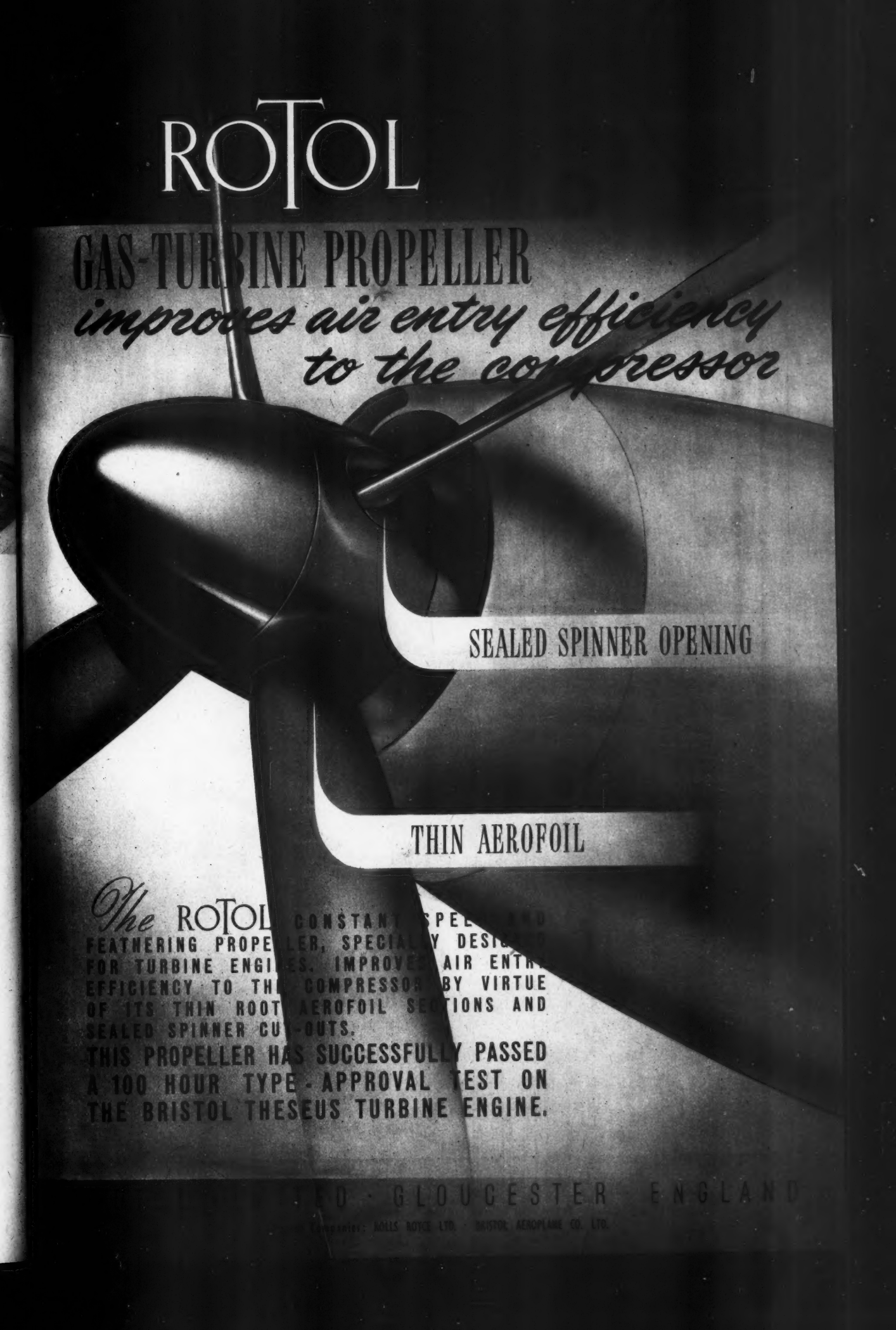
Fully modified Merlin 621 power plants, complete with exhaust manifolds and tail pipes on the inboard side, are specified, and de Havilland's

Latest aerodynamic modifications to the Tudors are (left) the new leading-edge wing root fillet and (right) the smaller and more shapely trailing-edge root fairing. The rivet holes for the attachment of the earlier large fairing have been accentuated to indicate its relative size.

ROTOL

GAS-TURBINE PROPELLER

improves air entry efficiency to the compressor



The ROTOL CONSTANT SPEED AND FEATHERING PROPELLER, SPECIALLY DESIGNED FOR TURBINE ENGINES. IMPROVES AIR ENTRY EFFICIENCY TO THE COMPRESSOR BY VIRTUE OF ITS THIN ROOT AEROFOIL SECTIONS AND SEALED SPINNER CUT-OUTS.

THIS PROPELLER HAS SUCCESSFULLY PASSED A 100 HOUR TYPE-APPROVAL TEST ON THE BRISTOL THESEUS TURBINE ENGINE.

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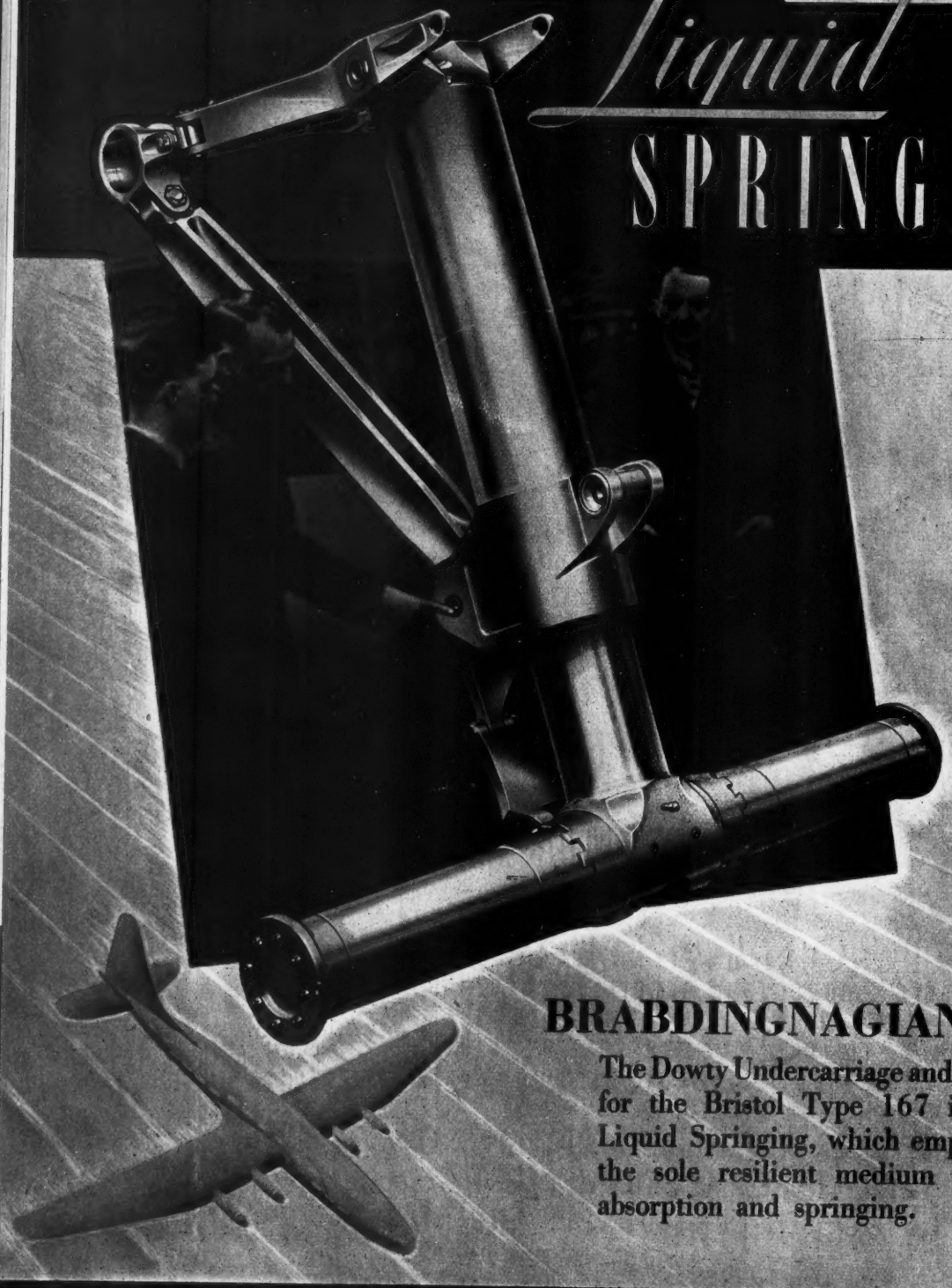
DOWTY

Liquid SPRINGING



BRABDINGNAGIAN LEG

The Dowty Undercarriage and Nosewheel for the Bristol Type 167 incorporate Liquid Springing, which employs oil as the sole resilient medium for energy absorption and springing.

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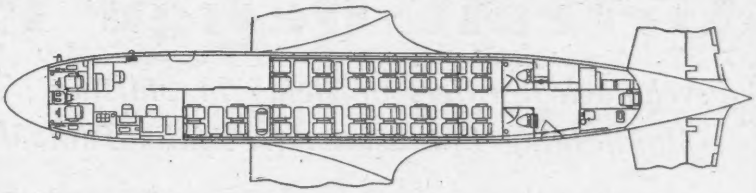
More About Tudors . . .



Proposed layout of the Tudor IVB for B.O.A.C. The crew section is the same as for the existing Mk I and the cabin as for the B.S.A.A. IV.

are to modify the de-icing shoes on the airscrews, shortening them to conform with those on the existing Mk IV. Improved fuel-tank dipsticks, and dials for the Smith's fuel gauges, are also called for.

Calculation of the total cost of a Tudor of any mark is going to be a very difficult task in view of the amount of development and modification that has been required. No official figure as quoted to the Corporations is likely to be announced, as it is considered undesirable where export orders may be concerned. However, at one time a round figure price of £140,000 was given for the Tudor I, and it may be assumed that the conversion to Mk. IV will cost something between £10,000 and £20,000 more per aircraft. As a cross check, an aircraft of 80,000 lb A.U.W. might be expected to cost £160,000 minimum and £200,000 maximum if the accepted production cost figure of £2 to £2 10s per pound weight is used.

Star Leopard, the fourth B.S.A.A. Tudor IV, is in fact the first conversion of a Tudor I to be completed, but this has nothing to do with the B.O.A.C. conversion plans. The first Mk. IVB cannot be ready for several months.

News of other Tudors now at Woodford is that G-AJKC and G-AIYA, the two V.V.I.P. Mk IIIs, are being brought up to full modification standard. We examined their layout and furnishing—the work of the Armstrong Whitworth company—and decided it was both luxurious and practical. The Mk VII (Mk II with Hercules engines) is doing a good deal of development flying, but no announcement has been made about its future. Another Tudor II is now flying, having been completed very recently. The future for Tudor IIs (Type 689) and the version ordered by F.A.M.A. (known as the Mk VI) is obscure. Finally, progress with the Tudor VIII is disappointingly slow. The bare airframe has been ready for some time, but the two twin-Nene installations will not be delivered for many weeks.

GRIFFITH BREWER

Death of First Englishman to Fly in Heavier-than-air Craft

WITH the passing of Griffith Brewer on March 1st, in his 81st year, aviation has lost its last personal link with the earliest days of flying. Not only was he the first Englishman to be taken up in a heavier-than-air craft (by Wilbur Wright at Pau, France, in 1908), but he made his first balloon ascent as a passenger in 1891. In neither sport was he content to remain a passenger; his first balloon "solo" was made in 1892, and in 1914 he got his aircraft pilot's "ticket" at the Wright school at Dayton, Ohio. When the Autogiro came along he learned to fly that, and later piloted his own Moth.

From Griffith Brewer's meeting with Wilbur Wright in 1908 sprang many things. First of all, he introduced the Wright brothers to the Short brothers, who had been famous makers of balloons for many years. The result was an order placed with them for six Wright biplanes, thus making Shorts the first aircraft manufacturers in England. Another was a close personal friendship between Brewer and the Wrights. He first visited them in 1910, and from then onwards was an annual guest at Dayton, with a few exceptions caused by the two wars. Even in the last war Mr. Brewer managed to visit his friends on more than one occasion, once returning from America in a Liberator.

"Flight" photograph.

The late Mr. Griffith Brewer.

Griffith Brewer's unceasing efforts succeeded in establishing the Wrights' claim to being the first men to fly, and the claim made by the Smithsonian Institute for the Langley "Aerodrome" was disproved and, be it said, finally retracted with great frankness.

It was Griffith Brewer who founded the Wilbur Wright Memorial Lecture which has been read every year, the war years included, and the fourth of which he delivered himself. The title of that was "The Life and Work of Wilbur Wright." Later Brewer was to become president of the Royal Aeronautical Society.

We have known Griffith Brewer since the foundation of our journal by the late Stanley Spooner in 1909, and have followed his work with interest and admiration. During the last war we were privileged to publish several articles from him on his trips to America and Bermuda. When his old friend Orville Wright died quite recently, we hoped to get Griffith Brewer to write an appreciation of the famous pioneer. Mrs. Brewer informed us that he had just had a bad fall and was not able to write. And now he himself has passed away. Never again shall we hear his wise counsel in that soft-spoken voice of his. We on *Flight* have lost a dear friend, and aviation has lost one of its founders.

Griffith Brewer, in 1895, married Beatrice, daughter of Clement Tudway Swanston, Q.C., and the Hon. Mrs. Swanston. She became the first woman to fly across the Channel, in a balloon, in 1906. They have two children, a daughter who is married to Capt. G. F. Meager, of airship prominence, and a son, Cyril Brewer, who is a schoolmaster. To Mr. Brewer's wife and children we offer our sincere sympathy in their bereavement.

On March 5th a memorial service for Griffith Brewer was held in Christ Church, Down Street, London, W.1. The Rev. Howard G. Marshall officiated. In addition to relatives and friends, those who attended the service included Lord Brabazon of Tara, Lt.-Col. Sir Francis McClean, and Col. Harry Delacombe, all of whom were associated with Mr. Brewer in the earliest flying days, and Professor G. T. R. Hill. The Royal Aeronautical Society was represented by Dr. Roxbee Cox, Capt. Pritchard and Miss Barwood; the Royal Aero Club by Col. Preston.

The memorial service was simple and dignified, in keeping with the life that has just closed.

SIR OLIVER SWANN

WE regret to announce the death, on March 7th, at the age of 69, of Air Vice-Marshal Sir Oliver Swann, K.C.B., C.B.E. Oliver Swann was one of the pioneers of British flying. As a Commander, R.N., he bought an Avro biplane with 35 h.p. Green engine. He fitted it with twin floats and, in November, 1911, managed to coax it into the air for a short hop over Cavendish Dock, Barrow-in-Furness, but a gust caught it and it was damaged in alighting.

On the formation of the Royal Naval Air Service, Commander Swann became its first Assistant Director, and in 1915 he was given command of the *Campania*, a Cunarder converted into a carrier. Later he transferred from the Navy to the R.A.F. After serving with distinction, he retired in 1929, but rejoined to serve throughout the 1939-45 war.

Aircraft Design Procedure

Psychological Effect of Delay in Starting : Mock-up Conference : Maintaining Enthusiasm : Pitfalls That May be Encountered

(Continued from page 267, March 4th)

WHILE these committees have been discussing the matter, and R.A.E. and Ministry of Supply officials have been vetting the design, the aerodynamic branch of the firm are checking the data used in the tender, estimating control areas, balance percentages, etc., and preparing a programme of the necessary wind-tunnel tests. The project office or drawing office are continuing their work, making more detailed layouts of cockpits and so on, scheming engine installations and other details needed for the wind-tunnel tests, and the design section of the stress office is scheming out the most efficient types of structure and disposition of load-carrying members.

If this work is delayed, because of time wasted by committees, or due to the firm being given no advance information, it represents a very genuine delay in the overall time to produce the type. The reason is partly psychological, partly practical, and is caused by the fact that staff taken off a design and then started again have to regain interest, to try to pick up the threads where they left them and to resist the temptation to redesign the whole aircraft in accordance with a new set of ideas. This last is fatal.

Assuming that all is going well, an important stage in the design evolution is now taking place. This is the construction in the experimental shop of a more or less elaborate full-scale model of the aircraft, called a mock-up. This is prepared to the drawings and instructions of the design group engaged on the preparation of lines, cockpit layout and so on, and is used to give the firm's personnel—and the customer and his agents—a better idea than they can get from a tender. It is used to position seats, controls, instrument panels and so on, in the early stages and, in the case of a civil aircraft, may include all the final equipment and furnishings.

After some weeks or months of preparation, depending on its size, an important conference is held which, if properly handled, can be most useful. This is the mock-up conference. At this conference the representatives of the user, the supervising authority, or authorities, and the firm, get together and attempt to reach agreement on all the installational problems shown by the mock-up. The success or otherwise of the conference depends on how far agreement is obtained, and this is not easy when 30 to 60 persons, all with their own pet theories, are each and every one trying to get his own way. To be successful, mock-up conferences must be held with the minimum of people, all sufficiently senior to make decisions on the spot which will be upheld by the bodies they represent.

Interpreting Wind-tunnel Tests

While the mock-up has been going ahead, the other sections of the design staff have not been idle. Wind-tunnel tests are being made to check that the main aerodynamic features of the design are satisfactory, and the problem of how many tests, how much to believe and how far to alter the aircraft to meet these tests, is a big problem for the designer. Wind-tunnel tests are a fundamental necessity and no design should be allowed to go ahead without them; but, and this is not always realized outside a design staff, they take time, and if the design is held up until the wind tunnel answers are available, considerable delay may ensue. Further, because of scale effect, inability to reproduce manufacturing inaccuracies on a small scale and (as the model is rigid) inability to reproduce distortion, the results are always suspect to some degree and have to be interpreted. Here the experience of the designer and his aerodynamics staff are necessary to guide the critical decisions of how far to trust their own ideas and how far to trust the wind tunnel.

During this period also, the designer is getting, with or without his seeking, general advice on his aerodynamic problems from the various research establishments. This is generally very helpful and no designer will neglect it.

The structures section of the firm, having received preliminary loading data, are proceeding with the estimation of loads, the choice of the most economical structures to take these loads, and the preparation of preliminary sizes and loads to enable the drawing office to make a start on the detailed design of the major structure. The structure weight estimates are checked, stage by stage, with the development of the structure and the loads to ensure that proper weight control is achieved. The weight section is also keeping a close watch on the mock-up to ensure that only equipment called for in the specification is being included, and notifying the designer when any departure from this is noted. From this stage on, no move either in the structure, the detail design, or the mock-up should be made without the weight section knowing of it and checking its overall effect on the aircraft.

The drawing office, at the same time, are going ahead with the overall lines of the aircraft, usually nowadays by lofting methods, and are getting from these lines the necessary dimensions to enable the more detailed parts to be drawn. Discussions are held with the experimental shop to decide on the best order for the issue of manufacturing drawings. Good co-operation here between experimental shop and design department can eliminate many delays at a later stage, and if a timetable be prepared, giving the stages at which information is required, this can be used as a check throughout the design to decide which drawings should be accelerated and so on.

Here, however, there can often be a conflict of ideas. The shops want to make a good show and as a result like an early issue of units which are easily completed, such as tailplanes. These are the very units which the designer wants to hold up, as they are the most in doubt while the wind-tunnel tests are incomplete. These arguments can usually be ironed out and the shops encouraged to go ahead with the major structure and with the parts of the aircraft which will contain most equipment.

Also, now that the design is taking shape, discussions take place with the production side of the firm to decide on methods of manufacture, size of units, amount of tooling and a host of similar matters. Here again, compromises and co-operation are highly desirable if the ultimate successful production aircraft is to result. The problems are often thorny ones and the chief designer has considerable responsibility, as he is the final arbiter as to which type of construction is to be used, and this may involve his firm in considerable changes of workshop methods and plant.

Review of Progress

By this stage, which may be three months, six months or twelve months from the submission of the tender, the general outline of the evolution is taking firm shape and it is convenient here to summarize the progress:—

Project work: Complete.

Aerodynamic studies: Proceeding. Preliminary results available.

Mock-up: Mock-up conference over. Recommendations of conference being incorporated.

Drawing office: Lines complete. Issue of basic structural drawings to shops.

Experimental shop: Jigs being made and templates prepared from mould loft lines.

The next period is one where continual supervision is needed over both design offices and experimental shop if time is not to be wasted. The first enthusiasm is waning, nothing seems to be happening, and unless considerable drive is given to the whole organization the whole programme will get out of gear and considerable delay will result.

The first step to prevent this is to prepare a chart showing the order of issue of drawings to the shops against a set of dates, and to ensure by constant supervision that this is kept to.

The second stage is to see that the experimental shop has a similar set of dates to work to, and to make sure that delays, such as in material supply and alterations to drawings, are not used as excuses to fall away from this timetable. As it is the nature of man generally to make excuses and to blame others, this period is one where the designer, in addition to ensuring the highest quality of design and drawings, has to act as slave-driver, mediator, and detective in turn or all at once.

The design is now proceeding steadily, the main structure should all be issued and things are beginning to take shape in the shops. Other mock-ups are also being made. These are functional mock-ups and represent parts of the aircraft which the designer wishes to check before incorporating them in the aircraft. They include fuel systems, new forms of flap operation, the pressurizing equipment, if fitted, and other matters of a similar nature.

Closely akin to these functional mock-ups, which must in most cases be made from actual parts of the aircraft, are the strength test specimens. These are decided on, bearing in mind the duties of the aircraft, the departures from conventional structures and similar matters. Nowadays it seems as if only a test on the complete aircraft will satisfy everybody.

Last Stages in Prototype

Passing quickly now from this period to the stage at which the various parts are assembled together, we reach the final hectic period in the evolution. Equipment is all coming along at the last minute; the systems have to be checked; the retractable undercarriage tested; the wing stiffness measured; vibration characteristics determined, and a thousand and one other things all seem to be conspiring to prevent the first flight.

At last the whole matter is complete, and the new design takes the air. The period which then starts is a most interesting, and most harassing, time, but it is not within the limits of this lecture, and here we must leave the evolution of the design.

The second part of Professor Lickley's paper dealt with the

types of pitfall that can be encountered in a design, and how they may be avoided. He took as a basis the statement of a typical set of preliminary requirements (see last week's issue), and illustrated it by the sketch design shown below.

The specification chosen could be looked on as a possible DC-3 replacement and therefore has to compete in a hard market, which requires low maintenance costs, low operating costs and reasonably long life.

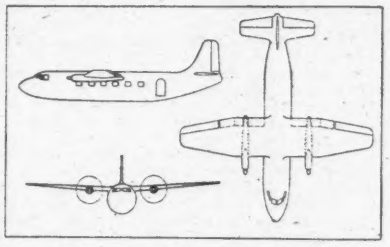
In the project stage, the designer has the alternative of high or low wing; elaborate flaps and high wing loading; or simple flaps and low wing loading. He can have a short, fat fuselage or a long, narrow one; and finally, for power plants, he can have reciprocating engines, airscrew turbine or pure jet types. In consequence, a number of project investigations must be made. On the weight side, the high and low wing arrangements must be studied from the undercarriage weight angle, bearing in mind always passenger convenience. With the flaps, cost of manufacture, time to develop and freedom from maintenance troubles, are all important parameters. Good detail design and an efficient structure are essential requirements to ensure a good payload and lack of maintenance problems

Choice of Power Plant

The operating altitude specified makes the choice of power plants a difficult one, and the cruising-speed requirement militates against the use of the turbine types, unless very fine overall aerodynamic efficiencies and fuel consumptions are provided.

To make things interesting, we will assume that the project office calculations finally show that a high-wing monoplane with two airscrew turbine engines, high-lift flaps and a wing of sandwich type construction make the best answer to the specification (see sketch design). Thus are the pitfalls easily provided and very careful design work will be necessary.

The first to guard against is that the change in trim with flaps, and the influence of tailplane position in relation to the wing, will not lead to an abnormal position or size of tailplane. This requires considerable wind-tunnel testing under all possible conditions of flight, engine-on, flaps up or down, and so on, and the design cannot proceed far until the results of these tests are available. The tests should be done at the highest possible Reynolds number, got preferably by using the largest possible model to enable flap contours, gaps and so on, to be accurately represented, and to enable fillet lines, etc., to be varied to find the best shape. The body-wing junction and nacelle - wing junctions must also be investigated to ensure that no premature breakdowns of flow occur at high incidence, thus preventing the special flaps from developing their maximum lift.



As two engines have been decided on, further wind-tunnel tests and aerodynamic calculations are needed to find the best shape of fin and rudder to enable the I.C.A.O. requirements to be met. This problem cannot be completely solved in the design stage, and the use of two engines must always be somewhat of a gamble so long as the present I.C.A.O. requirements exist. At this juncture it might be suggested that the biggest pit awaiting any designer is to try, first, to understand I.C.A.O. requirements, and, secondly, to comply with all of them while still constructing an aircraft capable of carrying an economic payload.

Passing now to the second problem linked with the flap choice: that of operating them. Here is a place where the best mechanical designers of the office must be started early to develop linkages, tracks and so on, and as they will probably be elaborate in nature, a functional mock-up should be constructed to find the best track material and forms of linkage having least weight, whilst the operating gear must be proved for reliability. Without this, flight trials at a later date may be held up because of minor defects in this mechanism.

Consideration of Undercarriage

While the aerodynamic arguments and tests are proceeding, the undercarriage must be investigated. Where are the main wheels to go? Are there to be double wheels on each leg? Is the nosewheel to be steerable? And so on. If the undercarriage retracts into the engine nacelle, then there is interference with the jet pipe; on the other hand, if retracted into the fuselage, the structure weight of the fuselage may be increased or passenger accommodation affected, although in the fuselage mounting the undercarriage weight may be appreciably reduced and a stronger undercarriage result.

Also, in any investigation it should be borne in mind that the high wing position gives a high c.g. position, and nasty pitching oscillations may take place on landing if nose and main oleo leg characteristics are not carefully matched. Careful dynamic calculations should be made to check this. The question of double wheels is a matter of policy for the operators; as the requirements stand at present, they represent an increase in weight, as the case of one wheel useless must be considered. As long as this somewhat doubtful requirement stands, fitting twin wheels will not be economic Greater strength could be got by improving existing single types (the burst tyre, of course, can only be dealt with by the twin type). Twin wheels also introduce different problems of stowage, and little is known of their shimmy characteristics. In fact, if twin wheels are chosen for the nose wheel, then the designer should consider ground tests as soon as possible on another aircraft to find out their characteristics. If an aircraft is not available, a bogie towed by a lorry might be tried.

The use of sandwich construction will probably be new to the firm, and will require complete tests, starting from small panels, leading up eventually to the whole wing. The tests will have to be made in close conjunction with the works to ensure that the test conditions can be maintained in the works during production. Tests must not only be made on simple static loadings; they must extend to internal pressure tests, suction tests to represent air loads, tests at elevated temperatures to represent the effect of heating by sun's rays, and fatigue tests to check performance under gust loads. Various types of joint for use with the sandwich construction must be developed, and close collaboration must be maintained between drawing office, stress office, test department and works. The complete series of wing tests in this case represents a most important section of the design and on them will depend the overall efficiency of the wing structure.

One further problem in sandwich construction is the chemistry of the various means of bonding, the repeatability of the processes and their simplicity from a works point of view. This problem can only be solved by considerable development work and testing of many hundreds of samples.

Investigation must be made into the best type of fuel-tank installation with sandwich construction, the effects (if any) of the kerosene on the various bonding resins, and the general sealing of such tanks. Unless bag-type tanks are used, a great deal of further test work must be done with fuel tanks full, half-full and so on. Methods of de-icing must also be considered, and if thermal de-icing is used, further tests must be made to check the effect of the hot air on the sandwich construction.

Engine Installation Problems

In passing, it might be asked why go to all this trouble, why not use straightforward stringer-skin-construction? The answer would be that the sandwich construction shows promise of greater structural efficiency, gives smooth internal surfaces for the fuel tanks because of the absence of ribs, and provides one of the best means of getting the necessary accuracy of contour for laminar flow.

As turbine power plants have been chosen, the designer must go carefully into the nacelle design to cut down interference, to provide good entry for the air, and to make sure the jet is discharged away from wing surfaces and clear of the tail. This requires careful wind-tunnel tests. He must get the engine manufacturer to do running tests representing operating conditions, investigate requirements of fire prevention (best runs for fuel pipes, electric leads, etc.) and, most important of all, must co-operate closely with the engine designer to ensure that all possible measures are taken to prevent icing-up of the compressor and turbine. Unless this can be done, the choice of engine would be most unsatisfactory for a civil air liner.

These represent the major investigations the designer would have to set in motion, but, however satisfactorily they may turn out, the results are of little value unless close attention is paid to good detail design and close linking of structural efficiency, detail design and weight control.

This leads to the concluding part of my lecture. Too often in the past and at the present day, the design offices of an aircraft firm are peopled with warring sects, the drawing office and the stress office being the chief ones. The continued arguments between these sects often lead to hold-ups, poor design (due to stressmen without design knowledge) or, constantly nowadays, poor detail design either from a strength or a weight aspect (due to draughtsmen without stress knowledge)

It seems to me that optimum efficiency will not be achieved unless the walls between these sections are removed and a universal design office takes their place, this office to be aided by a research group, aerodynamics group and detailing group (either doing detail drawing or detail calculation).

This involves giving draughtsmen considerably more technical training than they have at the moment, and at the same time widening the training of the present type of stressman to include drawing-office and design experience, and also to see that he gets a certain amount of shop experience. Only by these two approaches can we reach the optimum in design from all points of view. By doing this, I feel that designs would be got out more quickly. The detail design would be greatly improved, leading to better structure weight and fewer maintenance problems. This system could, with advantage, be further widened in scope by having in the power-plant section men with sufficient basic knowledge of propulsion problems to discuss fundamentals of engine design with the engine manufacturer and thus enable the data put forward on any given engine to be carefully checked at an early stage.

With the increasing complexity of modern design, I feel that much greater attention must be paid to technical education in its widest sense, particularly in the design offices. This can only be achieved by encouraging all concerned to widen their knowledge, by having a system which gives the best apprentices a chance of further education at a university, and by giving those with the highest technical qualifications a chance to get further in the firm than the present boundary walls of the stress office. Only by integrating the whole design staff into one unit can aircraft nowadays be designed in comparable times to those taken some years ago.

A summary of the discussion of this paper appears overleaf.

Aircraft Design Procedure . . . (The Discussion)

MR. S. SCOTT-HALL agreed with the lecturer that the specification period was important. The problem always in his mind was how to ensure that the specification would lead to a first-class aircraft, by which he meant a good flying machine and not just an expanding suitcase which could take all the equipment that some specification-drafters would like to put into it.

In the old days we had the "P.V.," but private venture was now ruled out by cost, and he believed the answer nowadays was the design study. By means of this, the drafting of a few lines of specification and sending them to the designers enabled the latter to form their ideas of what the aircraft should be. Given freedom to mould the specification, the designer would produce the best kind of aircraft.

With reference to committees, Mr. Scott-Hall said he sympathized with Professor Lickley, but modern aircraft were so much dependent upon radar, radio, armament, and navigational equipment, that there must be people sitting around a table who were able to say that, for instance, although the aircraft was a good flying machine, it was unsuitable for its purpose because it could not carry all that equipment. He agreed with the need for specialists on a designer's staff. There should be first-class hydraulic, electrical, radio and armoury experts, and they must have a status which enabled their views to be heard. He pleaded with operators not to hurry the early stages. Days and weeks spent then could save months or years later in the life of the aircraft.

MR. W. E. W. PETTER agreed with the lecturer that the best designs were obtained by inspiration rather than by specification. Fortunately, we in this country were given our military specifications in very wide terms, so that designers could think up a variety of solutions. He also agreed that weight control was important; we were now able to design more precisely. The lecturer was right in saying that the designer now was much more: he had to be a planner, a slave-driver and a co-ordinator.

The accurate mock-up was a wonderful means of helping the various experts to work together and to understand each others' problems. The integration of effort, as in a game of chess, demanded the bringing to bear as many pieces as possible in the right formation. All staff should have had experience in the shops for a time; all those who were to hold responsible positions should have moved around, and should have had experience in the airworthiness, aerodynamics and design departments, as well as some knowledge of the manufacturing side.

Mr. Petter thought there were several ways of breaking down barriers between departments. In his own organization (English Electric) the stress office had been turned into the airworthiness department and dealt with much more than stressing. An interested and competitive spirit was engendered which could lead to useful and rapid development. We must aim at deploying the organization to a wider engineering background.

Art, Science and Research

MR. E. F. RELF admitted that although Professor Lickley's statement about aircraft design being still an art and not a science seemed to be a reflection on the research people, he had to agree. We still knew very little about the real fundamental problems of flight. The position was now aggravated by our attempt to fly at sonic speeds, about which we knew practically nothing, nor were present methods of experimentation able to tell us more. Our problems were ten times more difficult than at the time of the Wrights, and we had to attack them with less equipment, relatively.

MR. WINGFIELD DIGBY did not agree that the watertight compartments existed in all organizations. His own, for instance, (Westland) worked on the principle that the man in the stress office worked in conjunction with those in the drawing office, and the man in charge of the weight office had free access to the various designers. Regulations were becoming more and more complicated. As an example, he recently discussed with the chief test pilot the number of flights needed to complete contractors' trials. To his horror they worked out at something like 250.

MR. H. H. GARDNER recalled the simplicity of design in the early days, when one chief designer went to the Air Ministry and had a chat with a few personal friends; he sketched out a design on the back of an envelope, and the prototype was flying within six months. In modern times the time spent by the design office had increased ten times, and involved ten times as much personal effort. The subject of weight control was dear to him, but he pointed out that the effort put into control of structure weight was devoted to only some 30 per cent of the total. It was time similar weight control was exercised in connection with other items. On the subject of widening the basis of knowledge, he pointed out that specialization was necessary, and that the general teaching would have to be confined to the early years.

MR. HOCKMEYER put in a plea for consideration of maintenance. It was no use, for instance, making the commutator of a starter motor easily removable if the starter could not be got off the engine or the engine out of the nacelle. The matter should be thought out all down the line. On civil aircraft it might be more economical to reduce maintenance work by accepting an increase in component weight. For instance, one might justify doubling the weight of a small component hidden away inside the aircraft if thereby one avoided serious penalties in the design of the aircraft.

A. CDRE. T. G. PIKE pointed out that, although an aircraft might be a very good flying machine, the modern military types had to carry so much equipment that it was necessary that the designer should be given, right from the start, the very fullest details of the things the machine had to carry. At what Professor Lickley had described as a bargaining match, which was known in the Ministry by the more sedate term "Advisory Design Conference," the purpose was to advise the designer on the more detailed points of the requirements. The reason was that the specification, if it was a good one, would have been in broad terms, and the designer must be told at some stage just what was required.

MR. SYDNEY CAMM said it was not, perhaps, surprising if the paper seemed very familiar, as he and Mr. Lickley had worked together for 11 years. He agreed with most of what was said, and emphasized the importance of enthusiasm if the result was to be good. A design was never in practice started *ab initio*. There was always a preceding design, and there was a tendency to deal with problems of the immediate present, leaving the Project Office to plough through all the various schemes and pictures.

On the subject of drawings, Mr. Camm said that if a prototype was wanted quickly, the drawings could be fairly sketchy, but if it was going into immediate production they would take longer. One must guard against the desire to put drawings into the main drawing office before the overall design was satisfactory. A matter which worried him was that of foreseeing the increasing loads that might be imposed later. They would affect wing loading, strength and c.g. movement. Mr. Camm stressed the importance of spending enough time on a project in the early stages. The average time for drawing-out a small fighter was two years.

Tooling Expense

MR. G. R. EDWARDS referred to the matter of complexity raised in the discussion, and said this had got completely out of hand, resulting in delays so that by the time a type appeared in production the purpose for which it was originally intended had almost been lost. Loss of time incurred great expense, and he was impressed by the fact that the American industry appeared to be charging into bankruptcy even more rapidly than were we in this country. On examination it was found that the cost of tooling and the production of even a conventional type fitted with piston engines could reach such astronomical figures that the manufacturer would have to make 300 aircraft before he got his money back. The world market was such that there was no hope of selling 300 of one type. He thought it was time we took stock of the situation and decided that perhaps for some types it might be cheaper to save a large amount in development costs and adding a little more to the running cost of the machines.

All the complexity led to the question of employing specialists on the staff; there was no escape from that. He agreed with Mr. Scott-Hall that the specialists should cover a wider field. The layout of an aircraft might well be governed by a major piece of navigational equipment. The practical solution was to have a tribe of experts in branches which had not been considered necessary hitherto. They must hammer out the job at the beginning, and they must be given time to hammer it out before the design was thrown to all the multitudinous group leaders in the drawing office who wanted to have a go at it. He thought that band of specialists would have to get on to a design twelve months before it was spread far and wide, and they must be given their head and encouraged to say what they wanted.

Mr. Edwards agreed with Mr. Camm that in producing a prototype, the experimental shop was important and that it and the drawing office must work side by side, fired with the same ideas whether drawings were being produced for production at the start or for getting out the prototype quickly.

MR. J. A C. MANSON was disappointed with the low priority the lecturer had given to considerations of production. It had, he said, become good practice in the aircraft industry for the production people to be consulted in the very early stages.

MR. N. E. ROWE agreed that one should concentrate, in military aircraft, on making one which would carry its equipment, but one should always make sure it would be a good flying machine. The lecturer had given no background to some of the essential things. Take, for instance, applied research. Who should do it, the firm? Or rely on national resources, and to what extent should they carry out *ad hoc* research in connection with design? His own view was that the organization should be complete to the extent of having aerodynamicists, mathematicians, etc, so that the designer could integrate into his project his own ideas of the things he had been told by the basic research men He would like to hear the lecturer's ideas as to the right balance of the design team, and asked how much one should concentrate on the various sides of the team. If there was too much concentration on one, another would suffer. He did not like the idea of a really first-class artist having to be a slave-driver. That function should be in the hands of someone else. The designer's mind should be on the broader issues.

MR. WEBB emphasized the importance of inspiration and enthusiasm and asked Professor Lickley how he thought such enthusiasm could be re-created in the industry. Since the war, individual enthusiasm had been largely swamped by the system which was developed solely to meet war needs. He thought it a shameful reflection on existing methods that many apprentices lost all their initial enthusiasm by the third year or so. The training methods concentrated on developing the mind whilst providing no stimulus for the imagination. The resultant product was too often a square peg in a round hole. He pleaded for the abolition of part-time courses and that instead of them there should be centralized full-time courses at intervals during works training. After training, good technical personnel should be encouraged to keep in close contact with aircraft. It should never be possible for anyone to boast of having designed an aircraft without even seeing it!

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A.M. Specification DTD.658 (Prov.). A Matt Synthetic one-coat Enamel for external metal surfaces	A one-coat finish for Alclad alternative to DTD.314	1-2	4 hours 4 hours
A.M. Specification DTD.517. A Matt Pigmented Synthetic Resin Finish for external metal surfaces	*Primer Matt Pigmented Synthetic Resin Finish Synthetic Thinners TSX.4	1 1	See Primer Schedule. ½—1 hour.
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A.M. Specification DTD.260A. A Pigmented Oil Varnish Finish	*Primer. Pigmented Oil Varnish Finish Synthetic Thinners TSX.1	1 1	
A.M. Specification DTD235. A Low Temperature Stoving Enamel Finish in all B.S. colours	Primer SX.41 Stoving Enamel Synthetic Thinners TSX.1	2 2	Stoved ½ hour @ 230° F. or shorter periods at higher temperatures.
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*PRIMERS.—Where Primer is not designated by Type Number reference should be made to Primer Schedule (page 5) in order to decide Type of Primer suitable for work involved, method of application, etc. All Primers marked with an asterisk (*) are interchangeable for various applications, as shown in the last column of the Schedule. GLOSS VARNISH COATING FOR USE OVER FINISHES TO ... DTD.517.—Subject to special permission from the appropriate Ministry, a final coating of Cellon Synthetic Varnish, ... applied to give improved smoothness, gloss and durability. **It is important that correct definition should be used when ordering to avoid mistakes arising.**

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AIR ESTIMATES DEBATED

Concern for Britain's Striking Power : Operational Training

THE Secretary of State for Air, Mr. Arthur Henderson, on going into Committee of Supply on the Air Estimates of 1948-49, said that the number of men and women in the R.A.F. to-day was approximately 274,000 and it was expected that this would fall to 226,000 during the next twelve months.

It would not be too much to say that what we were doing was to build a third Royal Air Force. The first was demobilized in 1919 and the second had been undergoing demobilization during the past two years, 1,122,000 men and women having left the Air Force since the end of the war. Our tasks were to ensure that the third Air Force was erected on the basis of the technical skill, the flexible organization, and operational experience which was so highly developed in the second. There could be no hard and fast rule as to what the balance of the force should be between defensive and offensive roles. It must be adjusted to keep pace with the development of weapons and technique.

While research and development were being pushed on unmanned weapons, it was clear that, concurrently, we must continue research and development towards the production of the aircraft, armament, and other equipment, upon which our security must depend for a number of years. We could already see the next stage, when stratospheric aircraft of the manned bomber and fighter forces would certainly require the very best crews we could produce, and special new equipment for navigation, bombing, interception and so on. We realized, however, that, under present conditions, our expenditure on current production must necessarily be restricted. At the present time, when we were still exploring fields opened up by the discoveries of the war—the guided missile, the gas turbine and jet propulsion, to mention only the most obvious examples—it would be unwise to go into expensive large-scale production of types which would soon be out of date. With fuller knowledge of future scientific developments, and, in particular, of the strength and limitations of the equipment now under development, we should be able to determine with greater confidence what new type of equipment must be brought into full-scale production.

The Air Minister said with confidence that our jet fighters—the Meteors and Vampires—were the best in the world. We were confident that we could keep our superiority over all comers in the interception-fighter class. Re-equipment of all Fighter Command interceptor squadrons with the latest jet types was virtually complete, only one squadron remaining outstanding. We had deferred re-equipment of our bomber force with jet bombers until the new jet engines with which future types were to be equipped had been fully proved. The prospect of jet bombers of exceptional performance was in sight. Meanwhile, the re-equipment of our bomber squadrons with Lincolns would be completed this year.

The remainder of our re-equipment for the current year mostly concerned Transport Command, where the new four-engined Hastings and the twin-engined Valetta were being introduced to start replacement of the York and Dakota.

Organization for Mobility

Exemplifying organization for mobility, Mr. Henderson stated that we detached aircraft of Bomber Command at short notice and send them on operational exercises from airfields in the Middle East. Other aircraft were sent to do the same kind of thing from a base in the Far East. Command exercises included the detachment of squadrons from their parent stations to operate independently from advanced skeleton airfields. All Hornet squadrons undertook long-distance flights from the United Kingdom to the Middle East and back, and goodwill visits had been paid to a number of countries. Last December, seventeen Dakotas flew troops of the North Staffs Regiment at very short notice over 1,200 miles from the Canal Zone to Aden without fuss or delay and without accident.

Altogether, the number of permanent and temporary married quarters in use at home and overseas was now about 7,550. It was hoped that within the next twelve months it would be not less than 9,350.

We still needed recruits for the twenty flying squadrons of the Royal Auxiliary Air Force. Although these squadrons were at present flying Spitfires and Mosquitoes, it was intended that those having suitable airfields should start re-equipment with jet fighters this summer. The squadrons were all flying again with their own pilots and with increasing help from their own ground crews. It was too early yet to see how recruiting would go for the new Air Defence Units and R.A.F. Regiment Squadrons. Over a thousand pilots, including twenty-four women, had been enrolled for the R.A.F. Volunteer Reserve. Some centres and Reserve flying schools would shortly be training signallers and navigators. In addition, the R.A.F.V.R. included the fourteen University Air Squadrons which now had 600 out of a planned total of 960 members to be reached in the third year of the Squadrons' post-war existence. The strength of the Air Training Corps was now about 42,000 cadets in 813 units, compared with 47,000 cadets in 859 units a year ago. Provision was being made for the numbers to increase again, as it was hoped they would during the coming year. The Royal Observer Corps reopened on January 1st, 1947, and at the end of January, 1948, had enrolled 12,150 observers and 326 officers. The full-time staff of some fifty officers was almost complete. As far ahead as we could see clearly, the R.O.C. would remain indispensable.

Concerning the Air Ministry, Mr. Henderson drew attention to the fact that, whereas the Ministry had a staff of over 5,000 in 1939, not counting the staffs now replaced by the Ministry of Supply and Ministry of Civil Aviation, it would have in the year 1948-49 no more than 7,300 to administer a force nearly three times as large. This included the National Service element and, as a result of scientific development, was much more complicated to administer.

Mr. Macmillan said that the House and the country would be relieved if figures could be given for the R.A.F. such as have been quoted for the United States Air Force. He feared that the truth of it was that the Americans, like the Wise Virgins, had not destroyed the old Air Force before they built up the new.

Anti-aircraft development was tending towards the use of the guided missile to counter the guided missile. This was a tremendously difficult conception because it amounted to trying to stop a golf ball in flight by driving another golf ball to collide with it in mid-aid. Who was going to direct this operation? Were Territorials, with a fortnight's training a year, coming in three days after mobilization, to undertake this delicate and complicated manœuvre? For the immediate future, guided missiles had achieved neither the accuracy nor the range to make the conventional bomber obsolete. We further needed the nucleus of a powerful air striking force of fast, high-flying bombers, together with a small but highly efficient fighter component.

Imperial Strategy

Mr. Macmillan recalled that a Commission, in a report to President Truman, had reached the conclusion that atom bombs in sufficient quantities, or other forms of weapons of that kind, would not be likely to be in the hands of potential enemies before the year 1952 or 1953. When, if ever, such weapons became available, we had no hope of being able to maintain a high production of aircraft and other munitions in the United Kingdom during a period of war. We would be more likely to build bombers in Winnipeg than in Manchester.

G/C. Wilcock felt that it was not fair to make a comparison between the American Air Force and ourselves because we certainly could not keep large numbers of bomber aircraft available in this country. They could not be stored in the open and he was afraid they would very soon deteriorate. G/C. Wilcock wished to know what liaison there was between the R.A.F. and the Ministry of Civil Aviation in relation to transport aircraft. The best aircraft for troop-carrying was the best transport aircraft for passengers. The interior fittings were merely frills. A standardized passenger plane would reduce costs, conserve manpower and enable us to put down a common spares service throughout our routes.

Mr. Max Aitken suggested that the striking force had been frittered away by the Government. The conference between President Peron and President Videla, set to the music of Royal Air Force Rolls-Royce engines, would have been a very different conference, and that went for Guatemala as well. We went into the fight like a lamb and came out like a lion. Now we seemed to be a lamb again. He did not think that the number of bombers we could send out on an actual operational trip was much above a hundred. The Minister might get a few more on paper. As for Fighter Command, he did not think that this was strong enough to repel an airborne attack on the same scale as Arnhem. He had commanded an Auxiliary squadron for more than two years, and they had not yet fired their guns because they had no range.

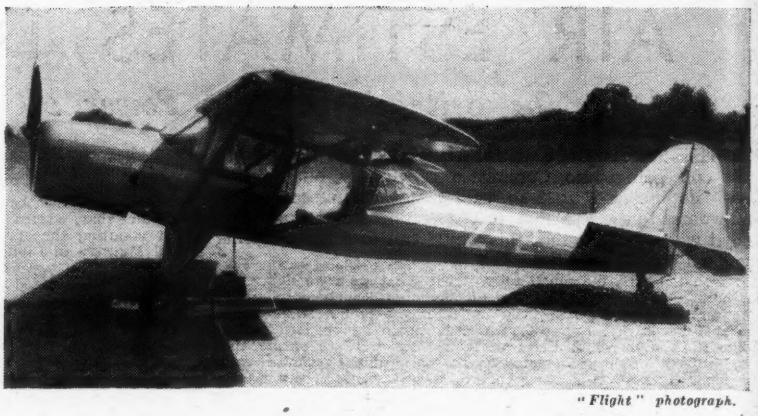
Mr. Ward said that if we had not a conventional bomber coming along, and if the jet-propelled bomber is not capable of penetrating beyond the "iron curtain" it was a very disturbing thing, and something ought to be done about it. It would be complete folly to rely in a future war on the output of the aircraft industry of the United Kingdom. Already, de Havilland, A. V. Roe, Fairey and Hawker had established contacts in the Dominions.

Mr. Quintin Hogg supposed that the figure for bombers which could be put into the air that night was very much more near twenty-five than the figure of a hundred spoken of by Mr. Max Aitken. We were spending upon armament generally more than we had ever spent on armament before in time of peace, and we seemed to have secured an Army that could not produce an effective striking force on land, a Navy that could not fight at sea, and an Air Force which could not fight in the air.

A. Cdre. Harvey said that we wanted development of a high-performance jet bomber capable of delivering an atomic bomb at long range. The Lincoln was a fine aircraft, but was really out of date. It was a good solid aeroplane, but its altitude was restricted with a full load and its range was restricted. He had heard that there was to be an intermediate bomber. His estimate was that we should not get long-range jet bombers capable of carrying an atomic bomb for eight or ten years unless something was done in the immediate future to give development and production a very high priority. He had grave misgivings about the situation.

Mr. de Freitas said that Canada made Lancasters and Mosquitoes during the war and was making aircraft like the North Star and the Chipmunk. Australia was making Mosquitoes, Mustangs, Lincolns and even Vampires.

HERE AND THERE



FLEDGELING: At the time of the S.B.A.C. Display at Radlett last year, an almost completed Auster Avis prototype made a surprise first appearance in the static park. Built to provide comfortable and economical flying for four people the machine bears a close family likeness to other Auster designs.

"Flight" photograph.

Type-Tested Mamba and its Airscrew

GOOD news was received last week of the successful completion of a combined military and civil type test by the Armstrong Siddeley Mamba airscrew turbine. This compact unit which gives 1,145 equivalent shaft horsepower for a weight of only 750 lb is to be the subject of a special illustrated description in our next issue.

As a result of the smooth running characteristics of the Mamba, it has been possible to fit a modified de Havilland Hydromatic 4/3000/4 airscrew of reduced weight and with blade roots unusually small for its power class. It is reported that the strength reserve is still greater than necessary, and a further reduction in weight of the 3000-size blade roots can be expected.

Three British airscrew turbines have now successfully completed a 150-hour type test. They are the Armstrong Siddeley Mamba (recently officially confirmed), the Bristol Theseus and the Rolls-Royce Clyde. It is stated that the last few months have seen important and gratifying advances in the development of British airscrew turbine power units.

Belfast Lecture Cancelled

AS Mr. Courtenay will be unable to give the lecture to the Belfast branch of the Royal Aeronautical Society which was to have taken place on March 16, the meeting arranged for this date has been cancelled.

Sealand Progress

SOME five hours' development flying has now been put in on the prototype Sealand amphibian which was recently completed at the Belfast works of Short Brothers and Harland, Ltd. It is at present back in the flight sheds for the addition of cabin furnishing, but is expected to be flying again very soon. It will be remembered that the Sealand carries 5-8 passengers and is powered with two D.H. Gipsy Queen 70 engines.

V.P. CIRRUS MINOR

OPERATORS of aircraft fitted with Cirrus Minor engines can look forward to improved take-off and cruising performance as a result of the recent approval for operation of the Minor fitted with a de Havilland manually variable pitch airscrew. The new mark of Cirrus Minor is to be known as the D503, and the following power ratings have been established:—

Take off at full throttle, 98 h.p. at 2,500 r.p.m.

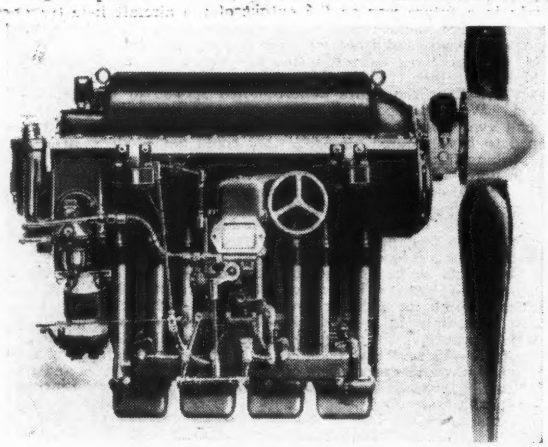
Climb at full throttle, 92 h.p. at 2,300 r.p.m.

Max. continuous cruising, 80 h.p. at 2,300 r.p.m.

Economical cruising (—2lb manifold pressure), 75 h.p. at 2,200 r.p.m.

Series II Minor engines can be modified for the fitment of the m.v.p. airscrew, and full instructions are given in the engine's technical instruction No. J3 from Blackburn Aircraft, Ltd., at Brough. The modification includes the drilling and tapping of the crankshaft in the centre of the existing airscrew boss keyway, and the modification kit includes a boost gauge connection, timing and setting plate and new cockpit instruction plate and name plate.

The Minor D503 is the first of three modifications in connection with v.p. airscrews, and it is also approved for operation by electrical control. Later the F503 with Fairey manually-operated airscrew, and the R503 with a Rotol design, are expected to be approved.



The D503 V.P. Cirrus Minor Series II.

I.O.M. Races

WING COMMANDER REX STOCKEN, who has organized the annual Whitsun air races in the Isle of Man in past years, has been informed by the authorities that they have decided not to hold the meeting this year owing to petrol restrictions, and because it was considered that it would be against the national interest at present. It is hoped that the event will be held next year if conditions have improved.

New Blackburn Chief Test Pilot

TWOFOLD congratulations to Mr. P. G. Lawrence, M.B.E., on his appointment as chief test pilot to Blackburn Aircraft, Ltd., as from March 1st, and on his engagement to be married. "P. G." succeeds G/C. C. J. Flood, O.B.E., who has now left the Blackburn company. Mr. Frank Bullen, who has been with the firm since 1947 and was hitherto production test pilot has also been appointed test pilot for experimental types and prototype aircraft.

Mr. Hives Visits S. America

MR. E. W. HIVES, managing director of Rolls-Royce, is due to leave to-day on a visit to the Argentine and Brazil. Mr. Hives, who is to visit the company's agents and government officials, is accompanied by a personal assistant who will lecture on British development of jet engines to technicians in the Argentine and Brazilian aircraft industries.

Cardiff Air Display

FOLLOWING a suggestion of Mr. G. E. Godsave, Cardiff Airport Manager, an air display and aircraft exhibition are to be held during the Bath and West Show which will take place at Cardiff during the week commencing May 24th. A committee has been formed under the chairmanship of Air Commodore Cadman to organize a static exhibition of engines, models, instruments, etc., connected with civil aviation in the grounds of the show during the week, to be followed by an air display at the airport on Saturday, June 5th; this display will be run in co-operation with the R.A.F. and the R.A.F. Association.

Swedish Visitors

NINE Swedish aeronautical students and a lecturer from the Royal Technical College, Stockholm, have arrived in Britain to spend a fortnight visiting the Imperial College of Science and Technology and leading aircraft manufacturers. Their programme has been arranged by the British Council and the S.B.A.C.

No German or Japanese Airlines

PRESIDENT TRUMAN'S Air Co-ordinating Committee has recommended that Germany and Japan should not be permitted to revive internal air transport systems. This is a safeguard against the rebirth of a military air force. Whatever air services are needed in these two countries should be provided by the occupation forces or international airlines of other nations.

S.B.A.C. Display 1948

IT is now officially confirmed that the S.B.A.C. Show will be held at Farnborough this year, and that the public will be given the opportunity to see it. Details have still to be worked out, but it seems probable that the date will be early September, and that the display will last for seven days. On two of the days, possibly Wednesday and Saturday, the public will be admitted, and on the Sunday it may be assumed that the usual R.Ae.S. Garden Party will be held.

The Clayton Prize

ONE-HALF of the Clayton Prize for 1947 has been awarded by the Institution of Mechanical Engineers to Mr. T. E. Beacham for his contribution to the development of variable-pitch airscrews, high-speed hydraulic pumps and other hydraulic devices.

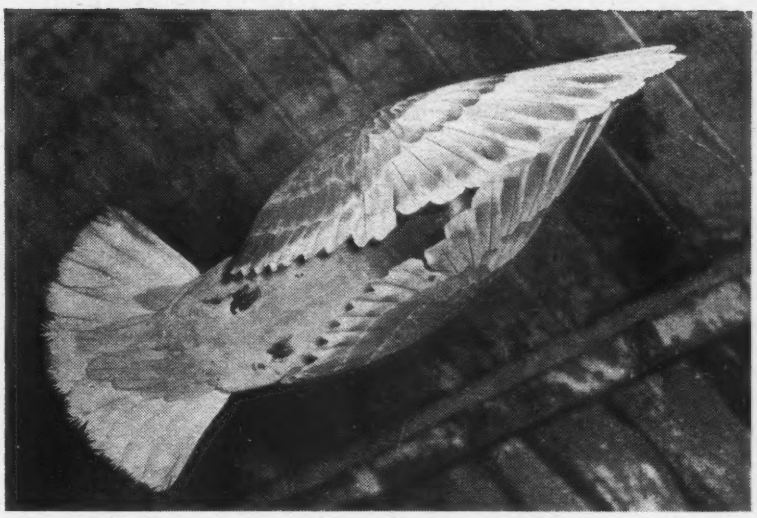
Mr. Beacham, it will be remembered, collaborated with the late Dr. Hele-Shaw in the early development of the hydraulically operated airscrew which was later taken over by the Gloster company, and still later developed into the Rotol airscrew of to-day.

Air Exploring

MR. MILTON REYNOLDS, the American fountain pen millionaire, who last April flew, with Captain Odom and a co-pilot, round the world in under 79 hours, has sponsored jointly with the Boston Museum of Science, an expedition to map and measure the Amne Machin mountains in North-west China. Very little is known of these peaks estimated at about 25,000ft A.S.L., and Mr. Reynolds considers that a mountain higher than Mount Everest might be discovered there, or in the Minya Konka mountains 400 miles farther south. A specially equipped Liberator has been selected for the expedition which will also search for the source of the Yellow River; a look-out will be kept for traces of airmen lost in this area during the war. There are some who say the mountains claimed more victims than the Japs.

Bonanzas for Business

THE Beech Aircraft Corporation, manufacturers of the Beechcraft Bonanza, have made an analysis of figures, revealed by an investigation of the uses to which owners put their aircraft, which shows that 70 per cent use their machines solely for business, 19 per cent for business and pleasure and 11 per cent for pleasure only. The average owner use is 399 hours 56 minutes per year, representing 63,989 miles per aircraft in a year on the assumption of a cruising speed of 160 m.p.h. The average passenger load being two persons, the 1,209 Bonanzas delivered in 1947 would, in a total mileage of 35,084,000, deliver 70,169,000 passenger miles of transportation. The analysis proceeds to compare the private operation of Bonanzas with road travel at an average speed of 40 m.p.h., and on this basis estimates a saving of $5,200 a year for each aircraft if the time of a business executive is valued at $6 per hour.



IN A FLAP: A remarkable high-speed photograph of the wing beat of a pigeon during take-off.

News in Brief

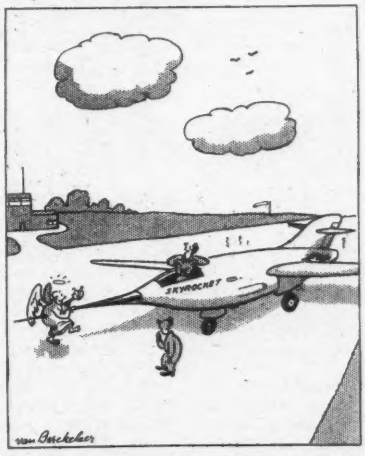
THE annual general meeting of the Aerauto Association will be held in the Albert Tavern, 52, Victoria St., S.W.1, at 6.30 p.m. on Thursday, March 18th.

* * *

Tiger cubs, leopards and a baby elephant will be among animals flown to Britain in Lancastrian freighters as presents from the Calcutta Museum to the Hull Zoo.

* * *

The following students of the College of Aeronautical Engineering have obtained first places in the recent Associate Fellowship Examination of the Royal Aeronautical Society: B. Eales, Theory of Machines; H. C. H. Merewether, Applied Mathematics; R. Melling, Aero Engine Design.



"Waal I guess that's taken care of the altitoode record."

At a London auction sale recently a collection of 1914-1918 British Colonial stamps belonging to Mr. G. H. Dowty, chairman and managing director of Dowty Equipment, Ltd., Cheltenham, fetched £3,500.

* * *

The Aviation Policy Board of the U.S. Congress, headed by Senator Brewster, recommends the expansion of the U.S. air defence force to 35,000 aircraft, 14,000 for the Navy and over 20,000 for the U.S.A.A.F.

* * *

The Federation Aeronautique Internationale has recently homologated a model aircraft record for distance, reported in *Flight*, February 19th. This record was made in the Rubber-driven (Rise-off-Ground) category by Mr. B. V. Haisman, of Liverpool, with a flight of 18.25 miles.

* * *

A new American gliding record has been set up at Inglewood, California, by Henry Stitelmeier and his twin brother Herman Meyers, who has shortened his name. The new record of 12 hours 52 minutes, compared with 10 hours 9 minutes, the previous record, was accomplished in a two-seater Navy glider.

* * *

The Fourth Annual Forum of the American Helicopter Society will be held in Philadelphia on April 22nd, 23rd and 24th. The meetings on the first two days will cover discussions on helicopter configurations, basic mechanical design, operations, testing, maintenance and economics. The last day will be devoted to the helicopter exhibits and an air show. Copies of the programme may be obtained through the general chairman, Paul W. Thomas, 12 S. 12th Street, Philadelphia, Pa.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

STUDY THE PASSENGER

But Don't Waste Time on the Ground

REFERRING to Mr. G. D. Hart's letter in your issue of February 26th, my family and I recently had to travel to Shannon Airport from London and back by Pan American Airways. The ticket was paid for in sterling. We were treated with courtesy and commiseration as poor relations. We could not buy a drink, as we had no dollars. The advertised time to start back was 0600. However, there was space on the trip due to start at 0345. We were airborne at about midday, and arrived at Airways House at 1500. So what is the point of flying at 250 m.p.h.? ROBIN GRANT.

London, S.W.1.

Some Misapprehensions Corrected

FROM G. D. Hart's letter in your issue of February 26th, on "Studying the Passenger," it would appear that he has been badly misinformed on a number of points.

The extraordinary point of view held by Mr. Hart that speed comes before safety must surely be a limited one. In any case, the schedules of all the air companies, on the North Atlantic route, are very similar, like the fares. For Mr. Hart's information they are as follows:—

Westbound between London and New York, the average scheduled overall times are as follows:—

P.A.A.	20 hr 40 min
B.O.A.C.	20 hr 45 min
A.O.A.	19 hr 45 min

On the eastbound route between New York and London

B.O.A.C.	16 hr 46 min
P.A.A.	19 hr 25 min
A.O.A.	15 hr 15 min

Mr. Hart cannot, therefore, accuse B.O.A.C. of being slow as well as safe.

In his letter Mr. Hart says "Stewardesses must be attractive and attractively dressed, not attired in a vaguely military ensemble with austerity cotton legwear." The B.O.A.C. stewardesses are picked extremely carefully. They are not intended to be mannequins. They must have personality, good looks, poise and a certain amount of nursing qualifications. The uniforms are specially designed by a leading couturier, and each girl is issued with nylon stockings.

We would point out to Mr. Hart that meals *are* provided free on board; most passengers finding them satisfying and adequate. Not everyone has the urge to eat continuously across the Atlantic, but for those who do, adequate snacks are provided at low prices; also cigarettes and drinks.

With regard to the pilot coming back to say "Hello" to the passengers, it is found that most travellers appreciate this small courtesy, they are able to ask questions and discuss the flight with the Captain, which makes them feel as if they are not being treated like packets of freight.

We are at a loss to know what Mr. Hart means by "European B.O.A.C. trips." There are no scheduled services to Europe by B.O.A.C. Marseilles, Bordeaux, Sicily and Malta are visited in transit as refuelling stops only.

We would take this opportunity of stating that over the period of the last six months 81 per cent of our passengers travelling on the North Atlantic run have taken the trouble to express full satisfaction at the service, speed and comfort of their journey. F. W. WINTERBOTHAM.

B.O.A.C., London. Public Relations Director.

JET NOISE

Word Wanted to Replace "Supersonic"

I WAS somewhat surprised to find Mr. Gurney Smeed (*Flight*, February 12th), in what appeared to be a factually correct letter on jet noise (at least, I am not in a position to question its accuracy) fall into error in a way that is becoming increasingly common.

Supersonic means exactly what Mr. Smeed thought it should mean—super-audible. It would seem that some other term ought to be concocted for "faster than the speed of sound in air," which is rather a mouthful. Possibly some reader has just the right abbreviation in mind.

There are one or two points about supersonic vibrations that might be of interest. It seems that way back in 1927 supersonic vibrations were set up in a bath of oil, by means of a crystal in the bottom of the bath, which was coaxed into vibration by 50,000 volts (alternating) at 300 k/cs. Among the most interesting effects were the following: a glass thread one metre long and 0.2 mm thick, became hot at the extremity remote from the liquid, into which it was dipped. The lower end of a rod of glass 0.5 mm thick was immersed in the oil. If a plate of glass were pressed against the top end of the rod, the rod rapidly drilled its way through the plate. Small fish and frogs were killed in one or two minutes by being placed in a beaker of water placed in the oil. This may have been due to overheating, although the beaker contained ice. *It is believed* that these supersonic waves may cause coagulation of the blood, in which case the operator (i.e., the dipper-in of rods, etc.) should be careful because of the possible formation of a blood clot.

In case any gas turbine operatives should feel at all worried, let it be noted that these experiments were done under laboratory conditions (Wood and Loomis in 1927). It is probable that the adjustment of the A.C. voltage to produce the standing vibrations was quite critical. One feels that such phenomena are unlikely to be produced by gas turbines in the normal course of events.

Suggestions for an alternative to supersonic please!

Wilford, Nottingham. A. SANSOM.

THE R.A.F.V.R.

A Plea for Advanced Types

I COULD not agree more about the joys of "Tiger-bashing" as outlined by "474" in your issue of February 19th—such, in fact, was one of the reasons for my joining the V.R. as soon as it was re-formed. But I am convinced that the provision of a few modern types would be of the greatest advantage to the V.R.

First, they would constitute an added attraction (possibly the deciding factor) to those many waverers who would like to join, but do not, having the impression that "Tiger-flying" is a waste of time.

Secondly, and most important of all, Tigers, though indisputably excellent *ab initio* trainers and likewise good fun for anyone, do most definitely encourage sloppy airmanship in the experienced pilot. In airmanship I include circuit discipline, general handling care, and particularly cockpit drill.

Thirdly, owing to the spasmodic nature of V.R. flying, ground crews frequently find themselves with time on their hands—or, worse still, are misemployed. A few advanced types to service would cure much of this; and certainly keep the airmen happier.

So, is there any good reason why the A.M. should not allocate, say, a couple of Spits. and a couple of Mossies—Harvards (or Masters) and Oxfords will do—to each V.R. unit? The only possible objection could be that of expense . . . in which case I am tempted to retaliate by quoting yet again Lord Trenchard's dictum of the value of "a small but *efficient*" peacetime air force. "JIMMY."

P.S.—Retention of substantive ranks, as is, I believe, Naval and Army practice, might also encourage.

Potential Pilots Grounded

MANY are the stories of headless horsemen who ride the highway by night, but I know a better. Yes, I know of a certain road where, on certain nights, a sixteen-stone copper practises steep turns on his bicycle round a deserted traffic island. I have seen him in mock pursuit—with imaginary A.I.—of an owl, weaving madly over grass verges and down side turnings and in the end triumphantly shooting it down with his flash lamp.

I have seen him practising S.B.A. approaches on a long hill, his flare path the moonlight, his beam the white centre line.

I have seen him in the daytime, on his country beat just outside the circuit of a R.A.F.V.R. airfield, gazing wistfully at the Tigers in the blue sky above him.

I have, too, heard him heave a deep sigh and mutter something about muddy Regulations. You see "474," this copper is one of many who are "ex-types," bound by pointless regulations from changing their Peeler helmets for caps, flying, leather; from resting their flat feet on a rudder bar for a few hours each week.

Show us a way round this silken picket of civi-street, "474."

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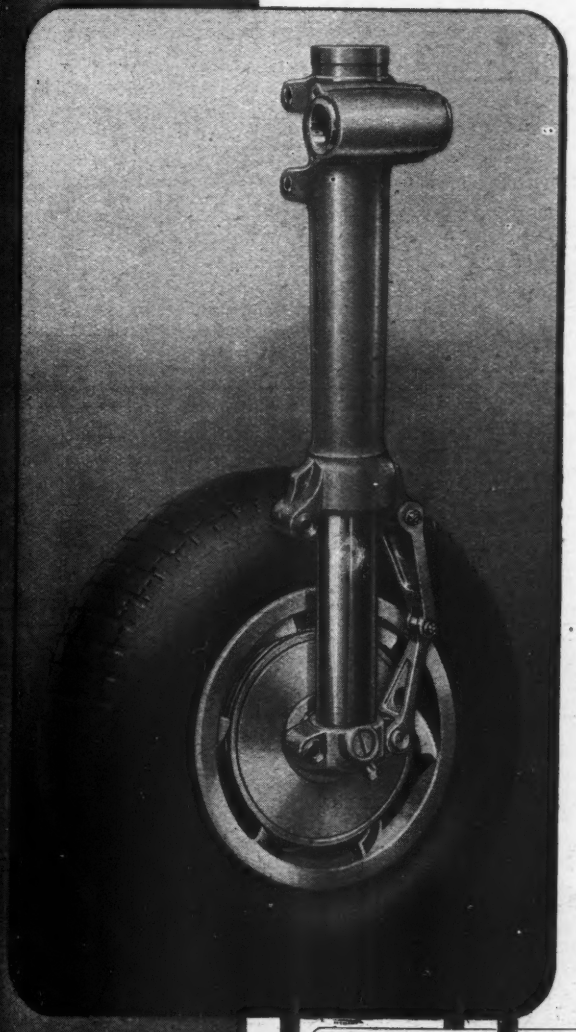

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and we'll gladly exchange for a few hours each week the fusty air of the court room for the air we know so well, but for heaven's sake, show us the way quickly, before that traffic island looks like the Wall of Death. "FLATFEET."

Cambridgeshire.

Three Causes of Lack of Support

I WAS interested to read the letter from "474" in *Flight* of February 19th, re R.A.F.V.R. recruiting, or the lack of it, being a V.R. type myself. Maybe the reasons I put forward for the poor support the V.R. is receiving are somewhat representative of other people's views also.

First, it must be remembered that all V.R. pilots at present have considerable flying experience, in the majority of cases over 1,000 hours, on all types of operational aircraft from Spits. to Lancasters or Mosquitoes, or even Horsas—in my case, or that old faithful, the Dakota; and that, in spite of "474's" exthusiasm over the Tiger Moth, most V.R. pilots (actual and potential) find the old Tiger distinctly small fry, not unnaturally.

Now I grant that the Tiger takes quite a bit of ability to fly well, but the mere prospect of Tiger-bashing is not sufficiently alluring to most ex-Service types; indeed, I count myself reasonable keen, but after an hour or so squeezed into the Tiger's cockpit (I am well over 6ft), sitting slowly freezing there and trying to hold a reasonable course in spite of continuous wallowing bumps (it always is bumpy when I fly!), I find myself wondering why I was ever such a fool as to join the V.R. to torture myself thus. For me, there is only one time for a Tiger, and that is a fine summer's evening.

Yes, I think more suitable aircraft is half the answer; the Prentice, if it ever comes, will be an improvement. At least we shall be able to carry out radio exercises, fly on cross-countries of reasonable length and in reasonable comfort (one cannot fly efficiently if always uncomfortable and cold), and keep in touch with Service technique and ideas on the flying side. And while I am not questioning official policy (and admit the paramount need for economy at this time), I do suggest that the V.R. is being starved for the benefit of the R.Aux.A.F.; the ex-fighter types can join the R.Aux.A.F. and fly Spits. (with promise of jets), while we V.R. types, many of us with multi-engine experience, are promised nothing better than, in the distant future, the Prentice. I do suggest that every V.R. unit should have, say, two Harvards and an Oxford, on which we might do one hour's flying for every four or five on the Tigers (or Prentice), such flying to be done during the annual training. Such a measure would, I am sure, be a stimulus to recruiting those who turn their noses up at "Tigers only," and the expense would only be a drop in the ocean of the present vast government expenditure.

Turning more briefly to other aspects of the question, I might deal with that of distance. I live over 30 miles (by road) from my V.R. unit, and no doubt others, prospective or actual re-servists, live farther; and even for those who possess a car or motor cycle this distance factor can be quite a big one, while for those who don't, public transport may be hopeless. Many people, especially those who are married, just cannot spare the time at week-ends, and I know they are very disturbed that the fourteen days' annual training may have to come out of their own vacation time—this is a big snag. I might add that I myself am not very pleased at the prospect of having to travel a round trip of 65 miles to attend lectures in the evening, as appears will have to happen when the full training scheme gets going. I think that when the full complement of V.R. units is open, then more bods will roll up and join who previously felt they lived too far away.

Then there's this age limit business; it was shown in the late war that many chaps over 30 were fit for ops., and even if they weren't then they could be employed with 100 per cent satisfaction on transport or instructional duties; so why such a poor gesture towards the over-30's? I know at least one chap who has been put off by the "over 30 no good" attitude.

I think that consideration should be given to permitting *ab initio* types to join, as pre-war. By this, they (and maybe the export industry or business employing them) would not suffer the inconvenience of call-up; and many who now do not want to spend longer than possible in the Services, and so are ineligible for normal aircrew training, would jump at the chance of becoming pilots without wasting time in the Services; instead, they could go along at week-ends and train then, at the same time keeping their "civvy" jobs.

As for publicity, I imagine that all eligible types know the V.R. exists; but, all the same, would it not be a good thing to send a circular to all eligible ex-pilots giving the fullest information on conditions, training, their nearest unit, and generally giving the V.R. a spot of boosting? This might quite likely stir a few into activity, especially if "put over" in the right way.

Those, then, are my somewhat long-winded views on the subject; and, although others may produce very good reasons for the V.R.'s apparent inability to attract pilots, I would cite lack of a decent aircraft, and the twin problems of distance and unwillingness to sacrifice spare time, especially holiday, as the three main reasons. Finally, I might add that my experience of almost five months elapsing from date of first application to join to date of attestation, is hardly encouraging to others; knowledge of such things gets about, you know.

Old Headington, Oxford. "RESERVIST."

INSTRUMENT-FLYING INSTRUCTION
A Plea for "Two-stage Amber"

WITH reference to the article "All-Through, All-Weather" in *Flight* of February 19th, I was greatly disturbed to see a photograph showing the arrangement of the hood on the Harvard for instrument-flying instruction.

Surely, when old ideas are giving way to new, this should apply also to the conditions under which the pupil receives his I/F instruction. The disadvantages and discomforts of the hood are well known to all pilots, especially on the Harvard, where the pupil has to fly from an unfamiliar cockpit which does not contain all the necessary controls and instruments.

The "Two-Stage Amber" installation overcomes all this, enabling the pupil to fly from his usual cockpit, whilst enabling varying degrees of darkness to be obtained. In addition, he can easily change from visual to I/F conditions without having to land and change seats, simply by lowering his goggles and vice versa.

It is apparent that this scheme is meeting with considerable opposition from many instructors on Harvard aircraft, thereby retarding its adoption in some of the schools. Their main objection is that it involves flying with a pupil in the front cockpit who is "blind."

I feel that this is the wrong attitude to take—after all, the area covered by the pupil's head is comparatively small—and that instructors should be prepared to undergo a certain amount of "discomfort" in order that their pupils may receive the benefits of a scheme that has been thoroughly tried and tested by a large number of experienced pilots and found acceptable. "EX-E.F.S. INSTRUCTOR."

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FORTHCOMING EVENTS

Mar. 11th.—R.Ae.S. (Yeovil): Lecture by P. G. Masefield, M.A., F.R.Ae.S.
Mar. 12th.—Institute of Navigation: "Air Sextants." F. F. Everitt, B.Sc.
Mar. 15th.—Institute of Transport (Gloucester): "Modern High-Speed Flight and its Commercial Possibilities." Eric Greenwood.
Mar. 18th.—Royal Aeronautical Society: "Flight Testing at High Subsonic Speeds." H. Davies, B.A., M.Sc., A.F.R.Ae.S.
Mar. 20th.—Society of Licensed Aircraft Engineers: "Brains Trust," in co-operation with the N.C.A. and A.R.B. Question Master, R. H. Hardingham, O.B.E.
Mar. 22nd.—R.Ae.S. (Bristol): "Operation of Civil Transport Aircraft." N. E. Rowe, C.B.E., F.R.Ae.S.
Mar. 25th.—R.Ae.S. (Yeovil): "Recent Development in Flying-Boats." H. Knowler, F.R.Ae.S.
Mar. 31st.—Royal United Service Institution: "Atomic Energy." Prof. H. S. W. Massey, F.R.S.
Apr. 1st.—R.Ae.S. (Manchester): "Flight Refuelling." C. H. Latimer Needham.
Apr. 1st.—R.Ae.S. (Yeovil): A.G.M. and Films.
Apr. 3rd.—Helicopter Association of Gt. Britain: "Problems in the Design of Multi-Rotor Helicopters." J. S. Shapiro, A.F.R.Ae.S.
Apr. 3rd.—Rugby Football. R.A.F. *versus* Army, Twickenham.
Apr. 5th.—R.Ae.S. (Derby): "Flight Refuelling." Sir Alan Cobham, K.B.E., A.F.C.
Apr. 7th.—R.Ae.S. (Gloucester and Cheltenham): A.G.M. and Films.
Apr. 7th.—R.Ae.S. (Luton): "Rocket Propulsion and Interplanetary Flight." A. V. Cleaver, A.R.Ae.S.
Apr. 14th.—R.Ae.S. (Graduates and Students): "The Influence of the Recent Civil Airworthiness Requirements on Civil Aircraft Design." W. Tye, B.Sc., F.R.Ae.S.
Apr. 14th.—R.Ae.S. (Bristol): A.G.M. and Films.
Apr. 15th.—Royal Aeronautical Society: "The Aerodynamic Problems of High Altitude Design." W. E. W. Petter, B.A., F.R.Ae.S.
Apr. 16th.—British Interplanetary Society: "High Strength Hydrogen Peroxide for Rocket Propulsion." V. W. Slater, B.Sc., F.R.I.C., M.I.Chem.I., and W. S. Wood, B.Sc., F.R.I.C., A.M.I.Chem.E.
Apr. 16th.—Institute of Navigation: "The Future of the Magnetic Compass." Cdr. W. E. May, R.N.
May 5th.—British Interplanetary Society: "Lunar Research." H. P. Wilkins, F.R.Ae.S.
May 11th.—R.Ae.S. (Graduates and Students): "The Light Aeroplane and the Future of Private Flying." P. G. Masefield, M.A., F.R.Ae.S.

"Flight" photograph

HOWLING AWAY: Harvards leave an R.A.F. training station, where the all-through training scheme is in progress, for a formation exercise. Aurally, the Harvard's take-off is still the most dramatic.

R.Aux.A.F. Appointment

THE Air Ministry announces the following Royal Auxiliary Air Force appointment:—

S/L. John Sidney Higginson to command No. 2502 (Ulster) Light Anti-Aircraft Squadron, Royal Auxiliary Air Force Regiment, located at R.A.F. Aldergrove, Northern Ireland.

Transport Experience

AN example of the long-range transport-support experience now being gained by aircrews of Transport Command, R.A.F., is provided by Command statistics for the three months ended October, 1947. On the 103 scheduled long-range services operated by Yorks, flying hours amounted to 10,814. Not one aircraft was cancelled from these or the medium-range services during the period. Passengers carried on the long-range services totalled 4,478 and freight weighed 1,077.2 tons.

Disbandment of 84 Group

NUMBER 84 Group, which was part of the 2nd Tactical Air Force during the war, has ceased to exist. Since July 15th, 1945, when 2nd T.A.F., having completed the task for which it was formed, ceased to be a separate command, the group had remained at Celle as part of the British Air Forces of Occupation. It has now been disbanded and such wings and units of the group as remain there have now been placed under the direct administration of Air Headquarters, B.A.F.O.

The group's reconnaissance wing was among those that first discovered and photographed the V-1 launching sites, and its Typhoons assisted the operation by bombing away the camouflage over the sites. "Anti-Diver" patrols were also undertaken when the flying bombs were later fired at this country. The fight against the menace of the V-weapons was continued by the group from its airfields on the continent.

The group began to form at Cowley Barracks, Oxford, in June, 1943. On D-Day it played a great part in the operations over the Normandy beach-heads, making no fewer than 1,016 sorties, and when in August, 1944, it was fully established on French soil it consisted of seven wings, including Norwegian, Polish, Belgian and French squadrons. The force operated in support of the 1st Canadian Army and took a full share in the victorious advance, including the closing of the Falaise Gap, the clearing of the Channel ports, and the crossing of the Rhine.

During the campaign in North-West Europe, from June 6, 1944 to May 4, 1945, the group flew 90,089 sorties, destroyed 198 enemy aircraft, 90 of which were shot down in the first month of the invasion; destroyed 3,819 enemy mechanized vehicles and damaged 4,690 others; put 621 tanks out of action; inflicted 1,246 rail cuts and destroyed 597 locomotives; and sank eight submarines and 263 small ships and barges. No fewer than 407 pilots belonging to the group lost their lives in the campaign.

Royal Air Force and Naval Aviation News and Announcements

Air Commodore Appointments

NEW appointments for three Air Commodores—two at Air Ministry and one at Coastal Command—have recently been approved. Air Commodore Robert Cecil Wansbrough has been appointed Director of Radio, Air Ministry. He was formerly Command Signals Officer at Headquarters Royal Air Force Mediterranean and Middle East. During the war he was attached to the Ministry of Aircraft Production for radio development work and was concerned with the installation of special radar equipment in aircraft.

The second Air Ministry appointment is that of Air Commodore John Marson to be Director of Armament. Air Commodore Marson has been Deputy Director of Armament since March, 1947 and was previously Deputy Director of Servicing and Maintenance.

Air Commodore Leonard de Ville Chisman, D.F.C., becomes Senior Technical Staff Officer, Headquarters Coastal Command, having been Group Captain Armament there since January, 1945.

Extended Malcolm Club Service

LORD and LADY TEDDER, with high-ranking R.A.F. officers, attended the opening on March 3rd of the Malcolm Club, Shop and Assistance Bureau at 322, King's Road, S.W.3, and of the Cocktail Bar and Restaurant at 24, Cadogan Gardens.

It is intended that the shop should benefit all Service and ex-Service personnel and their wives and families. Unrationed articles, ranging from furniture, refrigerators, china and glassware, to jewellery and paintings are in stock. The Assistance Bureau undertakes to solve queries, arrange travel, removals, repairs and generally to make itself useful.

Later it is hoped to provide at Cadogan Gardens accommodation for serving officers up to and including the rank of Squadron Leader.

End of Emergency Commissions

ALL future King's Commissions in the Royal Air Force (except in one R.A.F. Regiment course) will be permanent or short service. This means that no further commissions "for the duration of the present emergency" will be granted. Regular airmen will be eligible for permanent commissions, non-regulars for short-service commissions in ground branches, and aircrew (pilots and navigators) for short-service commissions in the General Duties branch with later opportunities for permanent commissions in the same branch or the Aircraft Control branch. In addition, any airman between the ages of 17½ and 19½ with certain educational qualifications may apply for a cadetship leading to a permanent commission in the General Duties, Equipment or Secretarial branches or in the R.A.F. Regiment. In

certain cases, temporary commissions for the time of their national service may be granted to men doing their national service.

"Vengeance's" Peacetime Record

THE Light Fleet Carrier H.M.S. *Vengeance* completed a remarkable record of peace-time service when she arrived at Plymouth on February 23rd. During the past 12 months she has: served as a Training Carrier; taken part in Home Fleet Exercises; taken the First Sea Lord (Admiral of the Fleet Sir John Cunningham) to Norway; been visited by Their Majesties the King and Queen during the Fleet's visit to the Clyde; been to Hong Kong and back; steamed 32,000 miles between the Arctic and Equator without a single breakdown.

New V.R. Schools

RECRUITING of R.A.F. and W.A.A.F. Volunteer Reserve pilots has now begun at four new R.A.F. Reserve Flying Schools which will open in the spring at Redhill, Surrey; Filton, Bristol; Manchester; and Grangemouth, Edinburgh, making a total of 17 schools in operation throughout the country. In addition, recruiting of navigators and signallers has now opened at four more Reserve Flying Schools already open for training pilots—Woodley, Reading; Rochester, Kent; Hamble, near Southampton; and Perth, Scotland. This makes a total of six schools at which navigators and signallers are now being enrolled as well as pilots.

R.A.F. Medical Services

THE Air Ministry announces the following appointment: Air Vice-Marshal Philip Clement Livingston, C.B., C.B.E., A.F.C., F.R.C.S., F.R.C.S.(E)., L.R.C.P., D.P.H., D.O.M.S., to be Director-General of Royal Air Force Medical Services in succession to Air Marshal Sir Andrew Grant, K.B.E., C.B., M.B., Ch.B., D.P.H., K.H.S., who completes his tour of duty in that post on March 1.

Air Vice-Marshal Livingston has been Deputy Director-General of R.A.F. Medical Services since September, 1947, having previously served for over a year as Principal Medical Officer to Air Command, South-East Asia. From 1934 to 1946 he was Consultant in Ophthalmology to the Royal Air Force, working at the Central Medical Establishment, R.A.F., London. He was awarded the Air Force Cross in 1942 for practical research into problems of aircrew vision. He was also made ex-gratia awards for inventions concerned with improving aircrew vision. He was presented with the Chadwick Prize and Gold Medal for researches connected with vision, and delivered the Montgomery Lecture at the Royal College of Surgeons of Ireland in May, 1942, and the Moynihan Lectures at the Royal College of Surgeons of England two years later.

Air Marshal Sir Andrew Grant has been Director-General of R.A.F. Medical Services since March, 1946. Before that he was Principal Medical Officer, Air Command, S.E. Asia, and in 1942-44, to Bomber Command.

R.A.F. Permanent Commissions

THE following officers have been selected, following recommendation, for permanent commissions in the Royal Air Force in the branches shown.

GENERAL DUTIES BRANCH

W/C.—P. Fleming.

S/L.—D. R. Bagnall, D.S.O., D.F.C.; E. V. Best, A.F.C.; E. Cassidy, D.F.C.; P. J. S. Finlayson; T. H. T. Forshaw; E. James; C. F. M. Jones, D.S.O., D.F.C.; G. D. Jones, D.S.O., D.F.C.; P. G. Leggett; K. F. W. Tapper; S. R. Thomas, D.F.C., A.F.C.; P. D. Tunstall; J. G. Wynne, D.F.C.

F/L. J. J. Barr; D. M. Birrell; S. E. Bulford, A.F.C.; J. T. Collyer; N. F. Curtis; W. G. Drinkell, D.F.C., A.F.C.; R. W. G. Freer; G. E. C. Genders, D.F.M.; W. I. Harris; L. G. Holmes, D.F.C., A.F.C.; J. C. Hutton, D.F.C.; D. S. Iles; H. G. James, A.F.C., D.F.M.; J. W. J. Leggett; C. G. Lewis; I. L. McCombie; R. D. A. Smith; P. H. Stembridge, D.F.C., A.F.C.; D. G. Winser.

F/O.—T. A. Bridge; J. V. E. P. Carter; M. A. D'Arcy; A. R. Gordon-Cumming; P. A. Latham; R. G. Morris; J. J. W. Salmond; M. E. Whitworth-Jones.

TECHNICAL BRANCH

W/C.—E. B. Loftus.

S/L.—J. Mills, D.F.C.; E. J. Brandon; D. G. Perry; F. L. Petch; G. H. Wass; C. G. Kimbrey; R. J. Mitchell; A. S. Mohan; D. A. Sinclair; H. A. Singer.

F/L.—F. V. Armstrong; D. A. Flint; N. F. Searle; H. B. Alty; F. M. Thomas; D. R. Watt.

F/O.—J. Mackenzie.

EQUIPMENT BRANCH

S/L.—J. R. U. Hatton; J. H. King; V. T. Land; A. M. R. Ramsden, O.B.E.

F/L.—R. Cartner, R. Hannaford.

SECRETARIAL BRANCH

W/C.—C. R. B. Wigfall.

S/L.—W. Bestwick; E. J. Cutler, O.B.E.; J. A. Ferguson; P. R. Grey; K. M. James, D.F.C.; V. O. Joseph; R. H. Petchey; D. C. Standen; H. A. G. Warren.

F/L.—H. T. Bowen, D.F.M.; D. R. Frazer-Clark; G. M. Heath-Smith; H. C. Southgate.

R.A.F. REGIMENT

F/L.—P. Lithgow.

AIRCRAFT CONTROL BRANCH

S/L.—L. Bennett, D.F.C.; J. T. Freeman, D.F.C., A.F.C.; G. G. Petty, D.S.O., D.F.C.; F. J. Robinson, D.F.C.; L. C. Young.

CATERING BRANCH

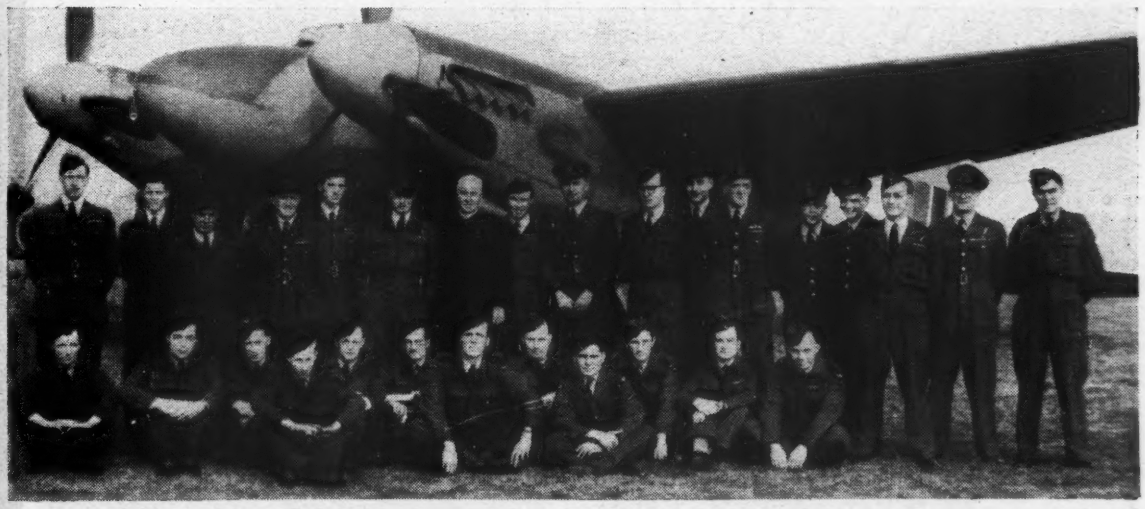
S/L.—S. R. H. Cadier.

Reunions

There will be a reunion dinner, for officers who served in any Coastal Command unit from the outbreak of war to V-J Day, at The Connaught Rooms on May 8th. Reservations—12s 6d—on application to W/C. E. F. Pippet, R.A.F., Eastbury Park, Northwood, Middlesex.

* * *

A 221 Squadron R.A.F. Northern Area reunion will take place on April 24th at the Bradford Hotel, Liverpool, at 6.30 p.m. Details from F/L. S. H. Evans, Lee Villa, Weld Rd., Liverpool, 23.



WARWICKSHIRE WEEK-ENDERS: *Personnel of No. 605 (County of Warwick) Squadron, Royal Auxiliary Air Force. At present equipped with Mosquitoes, the squadron operates as a day-fighter unit from Honiley. The Town Headquarters are at Castle Bromwich. Squadron Leader J. Walker, D.S.O. (centre of the back row) is the C.O.*

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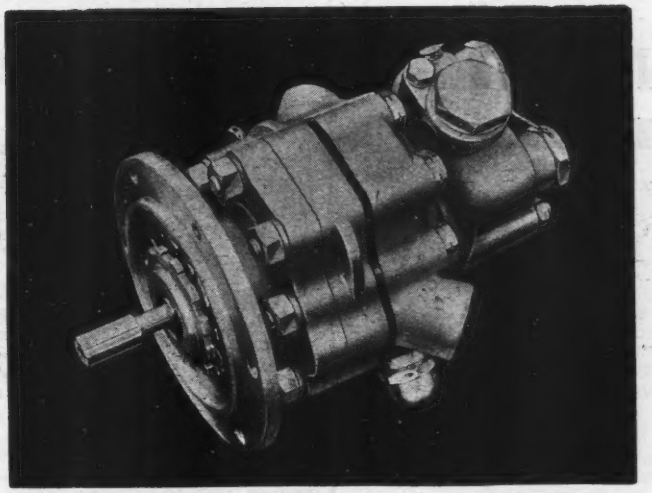

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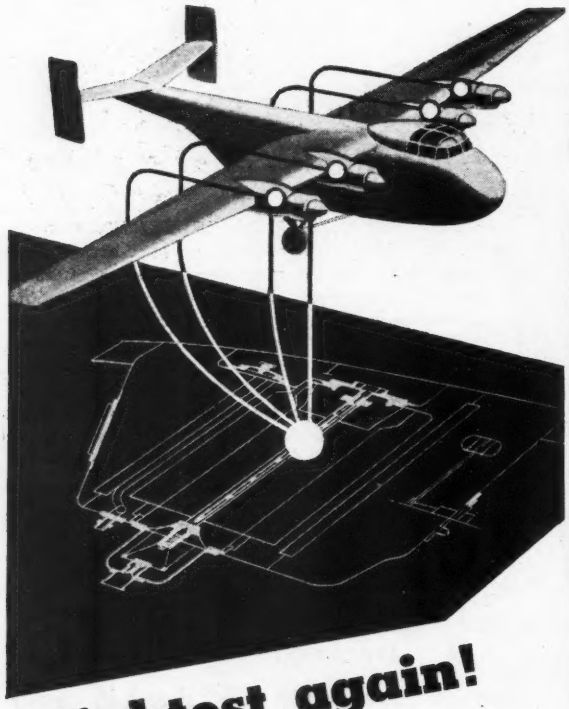

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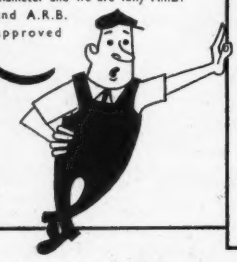

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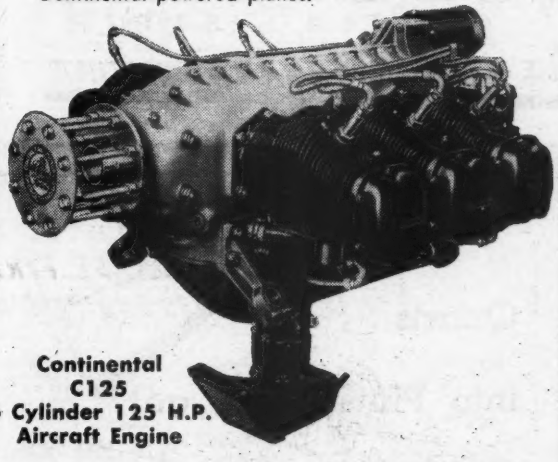

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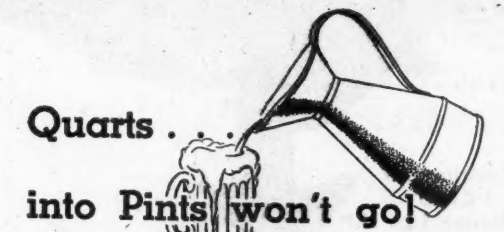

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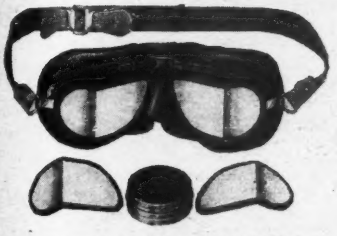

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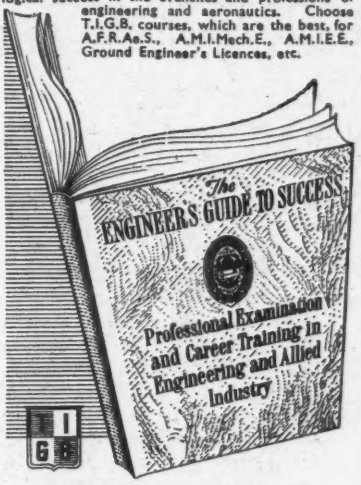
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PHOTOGRAPHY

AIRCRAFT photographs, 1/3 for sample and list.—19, Violet Gardens, Croydon. [1543

REUNIONS

A 123 Squadron Reunion Dinner will be held at Oddenino's Hotel, London, W.1, on Saturday, March 27.—Details from G. S. Mercer, 1d, Dawlish Rd., Leyton, London. [1531

47 SQDN., officers and aircrew reunion at Connaught Rooms, Kingsway, W.C.2, April 17th, at 6 p.m.—Apply R. Davis, 55, Alington Crescent, Kingsbury, N.W.9. [1554

TIME RECORDERS

STAFF time checking and job costing time recorders (all makes) for quick cash sale; exceptional condition.—Box 3654. [0040

TIME recorders; service rental.—Tel. Hop. 2239. Time Recorder Supply & Maintenance Co., 157-159, Borough High St. S.E.1. [1556

TUITION

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B.A.N.C.S. of course

THE British Aeronautical Navigational Correspondence School (B.A.N.C.S.) are specialists in aircrew licences, postal courses, so write to the Secretary, 143a, High St., Hythe, Kent, for the School's free prospectus. [0336

AIR TUTORS, Ayr, Ayrshire.

COURSES at Prestwick Airport for the new pilots' and navigators' licences, also instrument rating. TWIN and multi-engined aircraft and link trainers, fully equipped for S.B.A., radio range, I.L.S., G.C.A. and radio compass.

AIR exercises carried out on the spot thus reducing flying time.

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SPECIAL winter week-day rate for Auster aircraft £2 per hour solo or £2/10 per hour dual.

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NIGHT flying, £4 per hour solo or dual.

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NO entrance fee; no subscription.

MUNICIPAL AERODROME, Southend-on-Sea, Essex. Tel. No. Rochford 56204. [0332

THE LONDON SCHOOL OF AIR NAVIGATION announces the following full-time courses and commencing dates:—

COMMERCIAL Pilot.—Each Monday.

SENIOR Commercial Pilot.—April 12th.

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62, Great Cumberland Place, W.1. Tel. Pad. 4495. [0277

AIRCRAFT or automobile engineering. Complete practical and technical training for entry to either industry.—Syllabus from Bursar, College of Automobile and Aeronautical Engineering, College House, Princes Way, Wimbledon, S.W.19. Put. 4107.

ROCHESTER FLYING CLUB specialise in night flying at £4 per hour dual and £3/10 per hour solo in Tiger Moth aircraft, overnight accommodation always available, day rates are £3 dual and £2/15 solo per hour.—The Airport, Rochester. Tel, Bluebell 212. [0395

THE EDUCO TECHNICAL SERVICE, BCM/EDUCO, London, W.C.1; individual postal tuition for Aircraft Engineer Licence examinations also general aeronautical engineering, metallurgy, aero-engine inspection and allied subjects; write stating requirements. [1532

PILOTS and navigators' ground training with the personal touch; excellent accommodation and recreational amenities; fees are low, but a pass is still guaranteed; flying training available in the near future.—Hastinga School of Air Navigation, 4, Carlisle Parade, Hastings. [0406

BRITAIN'S AIR UNIVERSITY: Navigation school courses for the new flight navigator's licence, assembly dates for full course are April 12th May 10th, June 28th; courses for conversion from modified 1st class licence assemble April 5th, May 10th, August 9th; specific subjects covered by special courses arranged to suit individual requirements and convenience.—Full details from the Commandant, Air Service Training, Hamble, Southampton. Tel. Hamble 2185. [0327

SPECIAL arrangements for candidates for First Class Civil Air Navigators licence. Central Navigation School, Bush House, accepts students weekly for theoretical and Link trainer courses. Flying training for pilots and navigators.—Enquiries Bush House, Temple Bar 2913. [0412

WIRELESS telegraphy.—Short courses for P.M.G. Certificate of Civil Aircraft. Full courses for marine certificate for youth 16 upwards; plenty of vacancies in both services for numbers in training.—Particulars from London Telegraph Training College, Ltd., 20, Penywern Rd., Earls Court, S.W.5. (Tel. Flaxman 8721.) Est. 1896. [0299

Croydon Airport
Tel. No.: CRO. 5151/2 & 7744

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Terminal House, Victoria, S.W.1
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£1100 down.—**Rapides** fitted with Gipsy Queen III engines, completely overhauled, cabin furnishings and colour scheme to suit purchaser, 12 months C. of A., radio fitted by request, low engine and airframe hours; only a few left for disposal.

ENGINES.—200 Gipsy Majors, 50 Cheetah Xs, 25 Cheetah IXs, 20 Gipsy Queen IIIs; new and overhauled; several short-time Gipsy Majors from £50; large quantity Rapide, Tiger Moth, etc., spares in stock also new Rapide metal propellers.

£1000 down.—**Ansons**, 6-7 seaters and 2-crew, radio installed, new cabin furnishings; Tiger Moths from £625; Magisters from £325; all the above are completely reconverted and modified to date with 12 months C. of A.

TUITION

WIRELESS Telegraphy; postal course for P.M.G. Certificate for Civil Aircraft, also short courses of instruction at the School, including R/T for Pilot Officers.—Apply The British School of Telegraphy, Ltd., 179, Clapham Rd., London, S.W.9. (Brixton 3487.) Estd. 1906. [0218

MARSHALL'S FLYING SCHOOL trains pilots for A, B or Instructor's licences; dual and solo, hourly rates, £3 for Tiger and Auster aircraft; advanced training available on Proctor or Rapide aircraft; no entrance fees or annual subscription.—The Airport, Cambridge. Tel. 56291. [0245

AIRCREWS.—B.A.N.C.S. provide concise single lessons at 6/6 (ideal for all conversion courses), complete with illustrations, test paper and tutorial advice to the 1948 I.C.A.O. Navigator's and Transport Pilot's Licence standards; Supplementary Syllabus from Secretary, British Aeronautical Navigational Correspondence School, 143a, High St., Hythe, Kent. [0335

SITUATIONS VACANT

Vacancies advertised are restricted to persons or employments excepted from the provisions of the Control of Engagement Order, 1947.

COUNTY Borough of Southend-on-Sea.

DEPUTY aerodrome manager.

APPLICATIONS are invited for the appointment of deputy manager of the Municipal Aerodrome at Rochford; salary: Grade V of National Scales, i.e., £520—£15 (2)—£20—£570; the appointment, which will be for a period of not more than two years in the first instance, is subject to one month's notice, and to the National Conditions of Service; the successful candidate will be required to pass a medical examination.

THE person appointed will be required to act as Chief Flying Instructor to the Municipal Flying School, for which a Flying Bonus will be payable at the rate of 5s per hour flown.

APPLICANTS should have a good knowledge of the duties of the management of an aerodrome and the operation of a flying school; hold a B pilot's licence endorsed for flying instruction; have knowledge of air traffic control and fire prevention and fighting; also hold a current radio telephony licence.

APPLICATIONS, on forms obtainable from my office, should reach me, with copies of three recent testimonials endorsed "Deputy Aerodrome Manager," by not later than the 20th March next.

ARCHIBALD GLEN,
Town Clerk.
Municipal Buildings,
Southend-on-Sea.
4th March, 1948. [1557

ROYAL NAVY—Short Service Commissions in the Instructor Branch.

APPLICATIONS are invited from University Graduates and qualified teachers under 36 years of age for Short Service Commissions of 3, 4 or 5 years in the Education Service, Royal Navy. Requirements are for Officers with qualifications in Mathematics, Science, Engineering or Geography and to a limited extent for those holding good degrees in English, History or Economics. Opportunities will be afforded for officers, after two years service, to be selected for permanent commissions. A Short Service engagement in the Instructor Branch will discharge any candidate's obligation under the National Service Acts.

ENTRY will be in two grades. Selected candidates with 1st or 2nd Class Honours Degrees receive approximately £328 in their 1st year's Service, £347 in 2nd year, £438 in 3rd and 4th years, £474 in 5th year. Other candidates receive £237 in 1st year, £310 in 2nd and 3rd years, £347 in 4th and 5th years. Previous officer service in the recent war will be recognised for adjustment of seniority and rate of pay on entry. Married officers receive Marriage Allowance of £228 per annum if aged 25 or over, £117 per annum if under 25. Accommodation and rations are provided or allowances in lieu. An outfit allowance is paid. Tax free gratuities of £300, £400 or £500 are payable at the end of 3, 4 or 5 years respectively.

TEACHERS who enter from contributory service under the Teachers (Superannuation) Acts will continue in contributory service, superannuation contributions being deducted from the above gratuities.

INSTRUCTOR Officers serve both ashore and afloat and their duties include both technical instruction and general education; officers with suitable qualifications may also be appointed for general meteorological and weather forecasting duties. They are borne in the larger ships and in the Naval Colleges, Training Establishments and Naval Air Stations.

APPLY to Director (P), Education Department, Admiralty, London, S.W.1, for fuller details and application forms. [1495

SITUATIONS VACANT

BODY makers, coach joiners, screen fitters, required immediately by JAMES YOUNG, Ltd., Rolls-Royce and Bentley coachbuilders, London Rd., Bromley, Kent. Tel. Ravensbourne 3434. [0322

GLOSTER AIRCRAFT Co. have notified to the Ministry of Labour the following drawing office vacancies:—

10 Senior Draughtsmen.

20 Draughtsmen.

APPLICATIONS addressed to Employment Manager Gloster Aircraft Co., Ltd., Hucclecote, Glos., will be handed to the Ministry of Labour for routine disposal after consideration. [1493

SEVERAL first-class aircraft draughtsmen urgently required.—Chrislea Aircraft Co. Ltd., Exeter Airport, Devon. [1553

STRESSMEN required.—Apply, stating qualifications, experience and age, to Personnel Officer, Westland Aircraft, Ltd., Yeovil. [1435

ENGINEER required, A, B, C and X, with ability to control staff and build up small aircraft servicing organisation.—Box 6141. [1504

A. V. ROE & Co., Ltd., invite applications for the following appointments in their aerodynamics research division at Woodford Airfield Cheshire.

THIS is an integral part of the company's design organisation and the staff will have opportunities for obtaining comprehensive experience of the many and varied aspects of aerodynamic design and testing.

WIND TUNNEL

SENIOR to take charge of wind tunnel investigations in all its aspects, with a good engineering and some electrical knowledge preferably with science degree, age 25-32.

FLIGHT instrumentation and instrument testing.

SENIOR to take charge of instrument test room (aircraft instruments) for calibration repair and modification of all instruments used in flight instrumentation, age 25-32.

APPLICATIONS in writing only giving all particulars and salary required to:—A. V. ROE & Co., Ltd., Greengate, Middleton, Manchester, marking the envelope Aerodynamic Research Division. [1521

SENIOR stressman required.—Please send details of training, experience and salary required to Chief Technician, Gloster Aircraft Co., Ltd., Witcombe, Glos. [0369

WANTED, co-pilot, Johannesburg, Proctor V; take-off April 5; share running expenses; details experience, age and photo.—Vetch, 200, Old Bath Rd., Cheltenham. [1559

REQUIRED for S. Africa, pilots holding B licences endorsed for Dakota; preference given to those holding engineers O or A and C maintenance licences covering Dakota.—Box 6303. [1544

APPLICATIONS are invited from senior draughtsmen and stressmen.—Apply in writing or by telephone to Labour Manager, Vickers-Armstrongs, Ltd., Weybridge Works, Weybridge. Tel. Byfleet 240. [1309

THE DE HAVILLAND ENGINE Co., Ltd., require design and detail draughtsmen, preferably with experience in gas turbine and/or reciprocating engines.—Apply Personnel Office, De Havilland Engine Co., Ltd., Stag Lane, Edgware, Middx. [0400

AIRCRAFT mechanical design draughtsman required for interesting development work in helicopters minimum of 5 years aircraft development experience essential.—Write stating age, training, experience and salary required to Box 6375. [1555

H. M. HOBSON, Ltd., require a senior design draughtsman with good experience of exacting and fine limit work on hydraulic pumps and mechanisms.—Applications should be addressed to H. M. Hobson, Ltd., Hobson Works, Fordhouses, Wolverhampton. [1550

FERRY Pilot required end of March to fly Proctor to Middle East; salary and expenses will be paid during trip, etc., plus bonus if no undue delays.—For further details apply by air mail to Chief Pilot, The Contracting and Trading Co., Beirut, Lebanon.

NEWCASTLE-ON-TYNE AERO CLUB, Ltd., requires a qualified pilot instructor to take charge of club flying; full particulars in writing, including salary required to Hon. Sec., Newcastle-on-Tyne Aero Club, Ltd., Woolsington Airport, Newcastle-on-Tyne.

RADIO Operator/Flight Mechanic required by large industrial concern operating own aircraft, P.M.G. licence essential and must have had airframe and engine maintenance experience on Anson, Oxford or similar aircraft.—Write, giving full particulars, Box 6300. [1539

THE FAIREY AVIATION COMPANY, Ltd., Hayes, Middlesex, having a progressive and expanding programme in a wide field of aeronautics, invites applications from aerodynamicists, and stress analysts with initiative and enterprise and upwards of three years' experience; there are also a few vacancies for juniors with a knowledge of theory and design of structures, 38-hour 5-day week, pension scheme.—Apply, stating age, experience and salary required, to the Personnel Manager. [1455

SITUATIONS VACANT

SAUNDERS-ROE, Limited, have vacancies for senior design draughtsmen, stressmen and aerodynamicists.—Applications stating age, qualifications, experience and salary expected should be sent to Personnel Officer, Saunders-Roe, Limited, East Cowes, Isle of Wight. [0394

JIG and tool draughtsmen; senior jig and tool draughtsman with sheet metal, planning and tooling experience, and two experienced jig and tool draughtsmen required.—Apply Personnel Office, The De Havilland Engine Co., Ltd., Stag Lane, Edgware, Middx. [0404

WANTED.—Technician with a degree in mechanical engineering for work on aerodynamics, experience desirable but not essential.—Apply, stating age and salary required to the Chief Draughtsman, The English Electric Co., Ltd., Aircraft Division, Corporation St., Preston. [1505

THE DE HAVILLAND AIRCRAFT Co., Ltd., Hatfield, have a few vacancies for experienced detail designers and senior aircraft draughtsmen.—Applications, stating age, experience and salary required, should be marked "Aircraft," and addressed to the Chief Draughtsman, The De Havilland Aircraft Co., Ltd., Hatfield Aerodrome, Herts. [1350

HANDLEY PAGE, Ltd., have vacancies on their staff for technicians, including stressmen and aerodynamicists—preferably degree standard as well as senior design draughtsmen for extensive programme of very interesting work; good salaries and conditions; experience to Staff Officer, Handley Page, Ltd., Claremont Rd., Cricklewood, London, N.W.2. [1242

AIRWORK, Ltd., require for their branch at Gatwick Airport an inspector with full knowledge of M.O.S. contracts and 6/49 inspection conditions; applicants should be qualified to carry out process checks and check inspections; post suitable for ex-A.I.D. inspector.—Write, giving personal details, to Works Manager, Airwork, Ltd., Gatwick Airport, near Horley, Surrey. [1517

TECHNICIANS required for operating high and low speed wind tunnels, mechanical or electrical engineering degree or recognised diploma essential, the right type of men with good experience will be trained in the latest wind tunnel technique.—Apply, stating age and salary required to the Chief Draughtsman, The English Electric Co., Ltd., Aircraft Division, Corporation St., Preston. [1506

THE COLLEGE OF AERONAUTICS, Cranfield, have a vacancy for a runway controller, applicants must be fully experienced in the control of airfield traffic, preference will be given to those with aircrew qualifications; applicants should forward full particulars of qualifications experience and salary required, to the Registrar, The College of Aeronautics, Cranfield, Bletchley, Bucks. [1537

SEVERAL vacancies exist for draughtsmen and designer-draughtsmen on gas turbine work for aero-engines in London and for various applications other than aircraft in Rugby; candidates should have a sound mechanical engineering training preferably to H.N.C. standard but the main essential is previous D.O. experience in this class of work.—Apply to Central Personnel Services, English Electric Co. Ltd., Queens House, Kingsway, London, W.C.2. [1551

LICENSED engineers required for aircraft maintenance and engine overhaul at Barrackpore, Calcutta; "D" licensed engineer capable of setting up and running overhaul shop; "A/C" licensed engineer with comprehensive range of current types, including Dakota; one each A and C licensed engineers, unrestricted preferred; salary and allowances up to 1,000 rupees monthly, according to experience and qualifications; two years' contract initially; free passage both ways, including family; hostel accommodation available at approximately 80 rupees monthly, plus messing.—Apply by letter, giving full details of age, licence, experience, present and past employers, to British Aviation Services, Ltd., 1, Great Cumberland Place, London, W.1. Quote reference I.A.E. [0402

SITUATIONS WANTED

AIR steward, 1,200 flying hours, catering experience, requires similar position.—Box 6245. [1519

ENGINEER, eighteen years engine and airframe all types, C. of A. maintenance, etc., licensed "A" and "C" unrestricted; "O," Flight Engineer.—Box 6292. [1533

PILOT, age 29, B licence, 2nd N, instuctory endorsement and P.M.G., W/T and R/T licence, 6,000, twins and singles, no accidents, seeks any situation anywhere.—Box 6302. [1542

THE Guild have fully qualified licensed pilots navigators and instructors available for employment at short notice, also members experienced in aviation who are suitable for administrative appointments.—Londonderry House, 19, Park Lane, W.1. (Gro. 1212.) [0367

WANTED

WANTED to hire from March to Oct. 30th next, Rapide, Consul, Dominic or Anson aircraft, must have C. of A.; state terms required for period.—Box 6109. [1484

WORK WANTED

ENGINEERING tracing executed speedily and efficiently; 14 years' experience; sample supplied.—Box 6283. [1536

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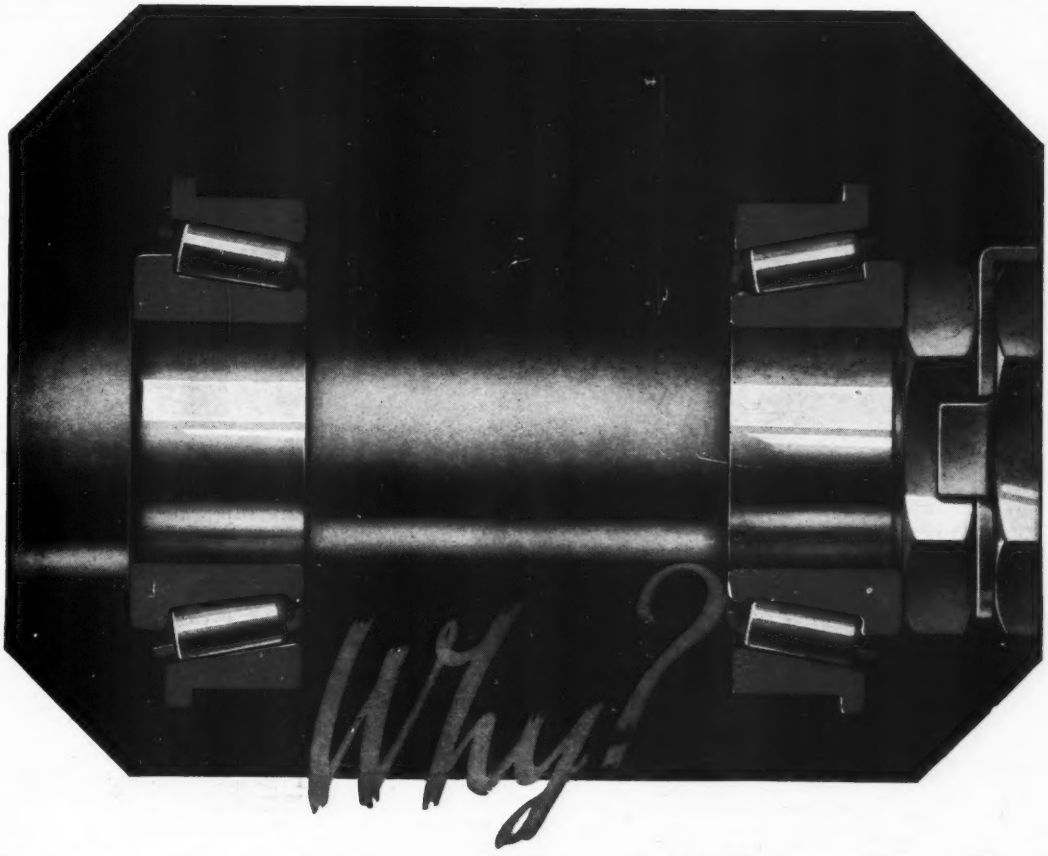

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MARCH 11TH, 1948

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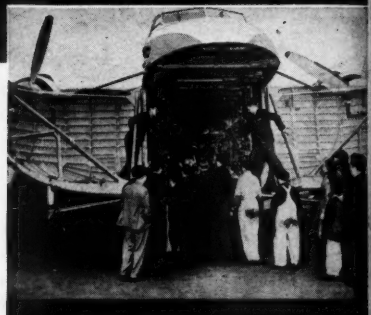

The Freighter doors swing open to reveal the crashed Consul

The Consul fuselage being removed from the Freighter's hold

AIR AMBULANCE
brings 'Consul' casualty from Spain

Cannibalism is fast becoming a habit of "Bristol" Freighters. Following a similar feat with a crashed Anson in Canada a short while ago, a Freighter recently carried back to England an Airspeed Consul which had been severely damaged in a night landing accident at Valencia. The entire aircraft was loaded into the Freighter's hold; centre-plane first, fuselage on top and wings and engines stowed at the sides. The Freighter, thus loaded, took off and delivered its cargo safely to Langley Airport for repair and re-assembly . . . successfully completing another outstanding air-freighting feat. The Freighter was chartered because, in the words of the pilot—"it was the only aircraft capable of doing the job"

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